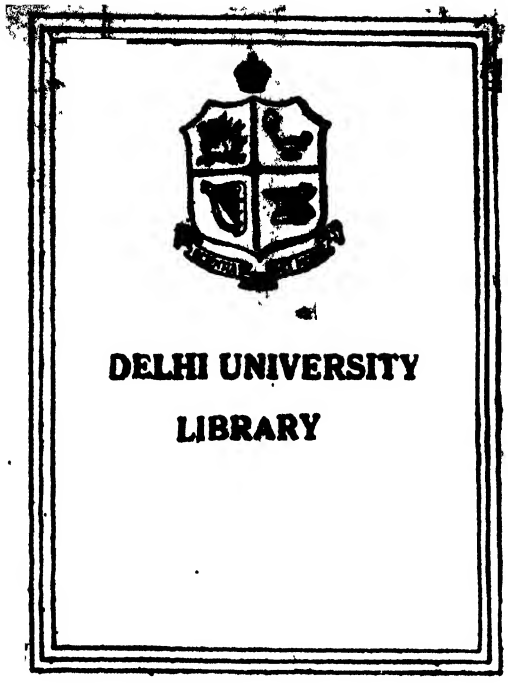

SHEEP FARMING

BY

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Foreword by

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AUTHOR'S NOTE

I have, so far as I have found possible, brought this small book up-to-date. There may be some advice offered and some opinions hazarded not altogether applicable to war-time conditions. I speak of sugar and whisky for lambs when I cannot obtain sufficient of these luxuries for myself! Such details I have left unaltered, for surely peace and plenty cannot be so far distant now. For any more grievous errors of fact or opinion I can only offer the excuse that during the last five years I have been busy upon other affairs.

A. F.

March 1945

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Foreword

By Sir John Orr, D.S.O., M.C., M.A., M.D., D.Sc., F.R.S.
(Director of the Rowett Research Institute, Aberdeen)

Whatever changes may be brought about in British agriculture by mechanization and Government marketing schemes and other measures applied with the intention of promoting its welfare, sheep farming must always retain an important place in our system of agriculture. There are large areas, especially in the West of Scotland, the North of England, and in Wales where the land is unsuitable for anything except sheep farming. In the grain-growing districts of the Eastern Counties, the benefit of even manuring and consolidation which certain types of corn land derive from sheep, makes feeding of sheep worth while, apart from the profit on the sheep themselves. Indeed, there are very few farms where either a permanent or a temporary flock of sheep does not fit into the general economy for the profitable utilization of pastures.

Farming includes many diverse kinds of production, and there are many farmers with no interest in certain branches of agriculture, even such important branches as wheat growing, sugar beet, dairy cows or poultry: but there are

few farmers who are not interested in sheep, and it would be difficult to find a farmer who would admit that he had no knowledge of sheep. In some respects sheep farming is the most fundamental part of British agriculture, and is likely to survive all changes. Indeed, it has survived the period of economic depression, from which we hope we are now passing away, better than most other branches of agriculture.

While all farmers know or pretend to know something about sheep, it is the pure sheep farmer, or rather the shepherd, who is at the job all the time, who is the fountain-head of sheep lore. To the sheep farmer and the shepherd, sheep are something more than animals, kept merely for profit. In Scottish sheep districts at least, sheep farming is as much a cult as a money-making occupation. I have no doubt this is true of other sheep districts in the United Kingdom. The shepherd and the flock are a unit: the one is lost without the other. The shepherd knows every ewe and its lamb, and their welfare, and not the profit they will make on sale, is the first consideration. Anyone who has been round the hill with the shepherd at lambing time has a better appreciation of the saying of our Lord, "The Good Shepherd Careth for His Flock."

I recall an incident which took place at Glasgow University many years ago when I was a research student there. For some scientific purpose the blood of a newly-born lamb was wanted. The Professor requested Mr. Walter Elliot (now Secretary of State for Scotland), at that time a science student, to go to his father's farm and procure the blood. Mr. Elliot went a little reluctantly, but returned without

the blood. It was impossible to buy a newly-born lamb for this purpose. The thought of cutting the throat of a newly-born lamb was almost as repugnant to the shepherd as the thought of killing an infant would be to a doctor.

Shepherds are not only fond of their flock, but they are proud of their job, and they know their job. At a sheep sale where, amid the bleating of sheep and the barking of dogs, many discussions go on between lairds, farmers, and shepherds, it is interesting to note the deference which both the laird and the farmer pay to the opinion of the old shepherd.

The flock are the shepherd's special care. He regards them as his own, and though he has no legal documents to justify his attitude, every wise farmer with a good shepherd adopts the same attitude.

The shepherd is an independent fellow who is not only proud of his job but proud of the prowess of shepherds. In the south-west of Scotland, a famous author of rather poor physique was being entertained. An old shepherd who had listened to the speeches about literature with a certain amount of contempt, in proposing the toast of the Chairman, put himself in the right perspective in one pregnant sentence, "Ony sauchle o' a body can write a book, but it taks a man to herd the Merrick."[1]

This digression about the shepherd is getting off the proper subject of an introduction. The excuse is that I like shepherds just as much as sheep. We might get all the mutton we need imported from Australia, New Zealand, and the Argentine; we might do without our sheep on the

[1] A hill in South Ayrshire which is difficult and treacherous to herd.

hills; but our national character could ill afford to lose the shepherd.

In this book on Sheep Farming, my colleague Dr. Allan Fraser has covered a wide range of subjects and of country. He has wisely concentrated on those aspects of sheep farming with which he is most familiar. Dr. Fraser has devoted many years to scientific research on sheep. He has also had many years of practical experience. He has herded sheep, managed them, bought them and sold them. For six years he was in charge of the sheep farm attached to this Institute, and the hill farm in Argyllshire which also belongs to the Institute. During these years he extended an already wide practical knowledge of sheep. The book is written not only from a profound knowledge, but with the enthusiasm that comes from a genuine love of sheep. It is written from the point of view of the field rather than the laboratory. It recalls the early dew on the grass and the bleat of the lamb rather than the smell of chemicals. It will be read with interest not only by sheep farmers and shepherds, but by all who are interested in the country.

JOHN ORR

ABERDEEN

December 1936

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Chapter One

The Sheep Industry To-day

There have never before been so few sheep in Britain.

The number of breeding ewes—and from the point of view of the stability and continuance of the sheep industry in this country it is the breeding ewe that matters—fell from 10,975,000 in the year 1939 to 8,165,000 in 1944. The total sheep population—all ages, over the same period declined by over six million—from 25 to 18 or so million.

The causes of this decline of an important source of the country's real wealth are easy to recognize—and I say *real* in contradistinction to the fantastic figures of a national expenditure that makes the paper value of a few million sheep look insignificantly silly. Pre-war statistics flattered the sheep industry. British farming had covered an anxious face in a green mantle, and sheep—any kind of sheep, fluttering like white butterflies over the green mantle—gave a fictitious suggestion of life to what was in reality progressive and accelerating rural decay.

War has whipped away that green mantle, and with it some six million sheep. The tractor has come and the sheep fled. Arable land has increased from 36 per cent of the

acreage in crops and grass in England and Wales in 1939 to 60 per cent in 1944. There has never been so much land ploughed since the legendary 'seventies.

War-time food policies have not favoured sheep. The Government drive has been for vegetable foods and milk. Pigs and poultry have crept into backyards. Sheep have been evacuated to the hills. No lover of sheep has cause to complain. Those who have designed and driven forward our war-time agricultural policies have the credit of success. The war has been fought *in* our fields, not *on* our fields, and that is a much better thing. If some millions of our sheep have become war-time casualties—well, so have a million of our best men.

We may, briefly, and for purposes of discussion, divide the country's sheep into three main classes—(1) Arable Sheep, (2) Grassland Sheep, and (3) Hill Sheep.

(1) **The Arable Sheep.** The time-honoured English custom of folding sheep on a succession of fodder crops on intensively cultivated land is one acknowledged good for the sheep, good for the land, but doubtful for the pocket. That was true before the war. It involves manual labour—and hard manual labour becomes less popular and more costly each year. It produced heavy sheep, and the consumer, when in a position to choose, prefers light sheep. In war-time it is a system that must obviously suffer. Once good land is ploughed and carefully cultivated in times of potential famine, it is clearly more sensible to use its produce directly for human food, grain for our workers, or, less directly but even more important, milk for our children, than to nourish the very best of sheep.

The decline in arable sheep-farming, however, although accelerated by war, was not caused by war. It is a slowly progressive decay of seventy years' standing. Thus, in the year 1868, 49 per cent of the sheep of England were in the eastern and south-eastern corn-growing counties, 51 per cent in the western and south-western grazing countries. By 1932 sheep in the east had decreased in numbers by 50 per cent, those in the west had decreased by only 13 per cent, so that only 36 per cent of English sheep were in the eastern counties and 64 per cent in the western counties.

There are still many farmers who maintain that the practice of folding sheep is essential to the fertility and cultivation of certain classes of light land. There can be no argument that on the arable land of England sheep have always been bred and fed for the good of the soil, perhaps even more than for the direct profit they might leave. The consolidation and even manuring that a flock of sheep provide are said to have a definite value on light, dry land where any profitable cash-crop can be grown.

I have never farmed sheep by this method, nor on such land. I cannot, therefore, speak from personal experience. May I quote from one who can?[1]

"The hurdling of sheep is a good custom, perhaps the very best that English agriculture has evolved in three centuries, but it is not Holy Writ. There are other methods of farming light chalk lands. It is well to remember that three hundred years ago the folding system was unknown, and that it has never flourished except in a relatively small patch of England."

[1] Ralph Wightman, *Farmer and Stock-Breeder*, April 1944.

That, no doubt, is true—but one sentence strikes me very much. 'Three hundred years ago the folding system was unknown.' Precisely! But it is within the last two hundred years, since the enclosures and agricultural revolution of the eighteenth century, that English mutton breeds have developed to supremacy if not perfection, and have spread the blood bred in 'a relatively small patch of England,' all over the pastoral world. Could such a creative triumph have been obtained by different, less intensive, less nutritionally generous methods? I think not. Sometimes I feel very much inclined to raise my hat to 'Mr. Folding System, Esq.' the best breeder of mutton sheep in old England.

(2) **The Grassland Sheep.** When I speak of grass land I mean temporary leys or permanent pasture (what is left of it!) on lowland farms.

The frenzied search for grassland sheep was the dominant feature of the pre-war industry. Following on the war of 1914–18 (I have to remind myself in my gathering years that many have no remembrance of that out-dated disaster!) the ploughed-up lands of our country tumbled back to permanent grass. Ploughs rusted and breeding sheep were in such demand that they maintained their war-time value for a decade after corn and beef were drifting towards insolvency. All kinds of breeds and crosses were tried, some appalling mongrels were produced, and some of the sheep were just sheep. There was an excellent demand for ewes of hill breeding, and hill flockmasters benefited. Ewes from the Welsh hills found a ready market, and the Scottish Half-Bred ewe or gimmer, generally acknowledged the best for the purpose in view, fetched some quite inflated prices. It was

the number of these ewes on an ever-extending grassland acreage that maintained the sheep population of this country between two wars. The ploughing up of that grass land is in the main responsible for the recent and substantial decrease.

(3) **Hill Sheep.** It is obvious that this type of sheep is of more importance in the mountain countries—Scotland and Wales—than in England. Recently it has passed through difficult times. The loss of its grassland market for surplus breeding stock; payment by weight rather than by quality; the increasing scarcity of wintering pastures; hard winters; the increase of vermin; all these blows have fallen upon a patient who was none too healthy before ever the guns started firing. The situation has been met—to some extent at least—by the hill-sheep subsidy. Evidently sheep, in the Government's eyes, are still welcome on the hills.

The subsidy may be temporary, but the ills of hill sheep farming are less so. There was a progressive decline in the number of sheep our hills carried long before this war. Thus, the sheep population of the five predominantly hill-sheep counties of Scotland averaged 3,082,712 in 1871–75, and 2,298,347 in 1938–42, a decrease of 25 per cent in seventy years. Moreover, I am fully convinced that the decrease would have been very much greater had it not been for the encroachment of both hill and sheep downwards on to marginal lands.

To sum up. The British sheep industry to-day is ticking over, awaiting the not-long-distant date when the country returns to a live-stock policy, as it undoubtedly will. This time there will be no tumble-down relapse to past agricul-

tural inglory. Sheep will play their part in an authoritatively planned future.

In the final chapter of this book I shall give my personal views upon what that future is likely to be.

Chapter Two

Sheep Breeds

No man can have personal knowledge of all breeds of British sheep: there are more than forty. I should not like even to venture a guess as to how many crosses there are. To write about sheep one has bred is to write of something too personal for impartial judgement. Each breed of sheep is the best to the man who breeds it. One hears much to-day about there being too many breeds, and most people agree that there are too many until the question arises as to which breeds are superfluous. Then agreement dissolves in strong speaking.

It is interesting, however, and I hope profitable, to consider certain more general questions of sheep-breeding —how and why representative breeds have arisen, what their value has been in the past, and what breeds the future is likely to perpetuate or provide.

The first point to remember is that sheep were originally bred for wool and not for mutton. Wool production in England was at one time of as great importance as it is in Australia to-day. Lord Ernle has written: "Wool

was the chief source of the wealth of traders and of the Revenues of the Crown. It controlled the foreign policy of England, supplied the sinews of our wars, built and adorned our churches and private houses."[1] Thus we have the Long Wools and the Short Wools and the Lustre Wools of old England. Nobody bothered much about mutton in those days. Canterbury was famed for pilgrims, not for lambs.

There can be no doubt that soil and locality have a most pronounced influence upon wool. Short wool will grow to its finest on a wether's back and on poor soil; a heavy long-wool fleece will not come off a hill. Moreover, in olden times the quality of soil was of even more importance than it is to-day. There were no artificial manures and imported feeding stuffs to level out the productivity of counties; sheep were then—in a sense they can never be to-day—imprinted with the seal of the district whence they came. I do not believe for one moment that if you put Merino sheep in Lincolnshire the passage of centuries would yield a coarse and lustrous fleece: I do not imagine nature to be so easily changed by nurtural means; but given an original sheep with some variability in its fleece and men anxious to find a profitable outlet for the wool produced, then I do think that a man who attempted to produce fine wool in Lincolnshire would have failed, and that attempts to produce a lustre wool on Sussex Downs must have failed. In each district, given time, I imagine a breed of sheep to have been evolved which had some special quality of wool useful in manufacture, which the locality was best fitted to produce.

[1] *English Farming, Past and Present*, 5th Ed., 1936, p. 80.

Unlike mutton, the uses of wool are manifold. Thus Scotch Blackface wool is used for carpet manufacture; Lincoln and Devon wools for upholstery fabrics, bunting braids, and lustre fabrics; Border Leicester, Wensleydale, for linings; Down wools for hosiery. Nowadays, blending of wool is so universal, and the efficiency of wool manufacture is so great, that the breed characteristics of wool are perhaps of less importance than of old. Even so, there is practically no kind of wool that cannot be put to some kind of use, and a multiplicity of sheep-breeds, provided their fleeces are expertly graded, is of no disadvantage to the wool-manufacturer—rather the reverse.

When the industrialization of England led to a general rise in the standard of living, the mutton characteristics of English sheep began to rival and finally to eclipse those of wool. The introduction of clovers and roots into customary rotations, together with the land enclosure movement during the eighteenth century, made the satisfaction of a growing demand for mutton a possible and profitable commercial venture. Breeders who, like Bakewell of Dishley, bred for mutton, swept the country with their sheep. The mutton qualities of most English breeds were improved either by the use of Bakewell's Leicesters or the South Down breed.

English genius in stock-farming, combined with the development of the folding system by which sheep were given full nutritional scope to show what they could do, resulted in England becoming the world's centre for mutton breeds of sheep.

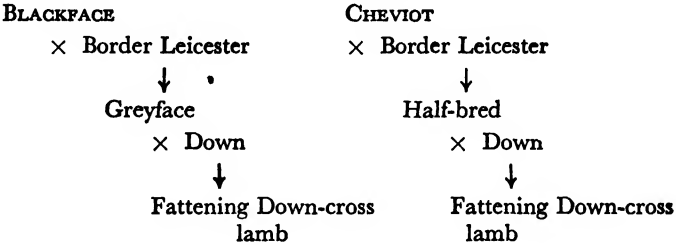
For a long time, indeed throughout the nineteenth cen-

tury, new countries undergoing pastoral development were constantly experimenting with British breeds of sheep. That experimentation is not yet concluded. Some years ago I was concerned with the export of Scottish Blackface sheep to Palestine! There can be no doubt that the possibility of developing an export trade, and its lucrative nature when secured, have encouraged the establishment and continuance of the large number of English breeds. From the point of view of British agriculture the export trade may be a positive disadvantage, since it places our best guns in the enemies' hands, but for the individual breeder of pedigreed stock it may be a single and colossal plum that fills the entire basket. Is it not recorded that an exported flock changed hands at £40,000? So the man who lightly talks of scrapping a hypothetical superfluity of English breeds must remember that there are vested interests and sunk capital in every single one of them. Personally I should grieve at the passing of any old and well-established breed of sheep. I should like to see some, if only a few flocks, of each preserved. After all, it is so much easier to destroy than to create, and the needs of the future are difficult to foresee.

It is possible that too much indiscriminate crossing goes on, but that again is an experimental seeking for new sheep suitable to new economic conditions.

In Scotland, breeding practice has been fairly well stabilized for many years. The two hill breeds, Blackface and Cheviot, have found their respective levels. The former is predominant on hills throughout Scotland except in the extreme north and the extreme south. Both Blackface and

Cheviot are crossed with the Border Leicester to give the Greyface and that very popular breed in England—the Scotch Half-bred. Greyface and Half-breds are crossed with Down breeds, usually Oxford or Suffolk, to produce fattening lambs. The scheme may be represented in a diagram.



Thus by two crosses, first with the Border Leicester and then by a Down ram, fat lambs suitable for the modern trade are produced from the basic Blackface and Cheviot hill stocks. In Scotland such a system works well because there is sufficient hill country to supply the low-ground with cast ewes and maiden ewes for crossing in the uplands, and finally in the lowlands. A similar system would not work in England without large importations of hill ewes from Scotland and Wales. Even so, one of the features of recent English sheep farming has been the more extensive use of hill ewes. By crossing these with a Down ram on pasture a very excellent milk-lamb can be produced. Indeed, from a butcher's point of view it is hard to beat a milk-lamb by a Southdown ram out of a Welsh ewe.

What are the qualities of a hill ewe which make her valuable? She is small, she is economical to keep, and she is a good milker. These qualities I believe to have been stamped on hill breeds by natural selection: a big and

greedy ewe will not live on a hill in hard weather, and one that milks poorly will leave no lamb. Only strains that are small, thrifty, and milky will survive. That is why, as is developed in a later chapter, I dislike the artificial feeding of hill sheep. Ewes helped through winter and spring may look very pretty at autumn sales, but they have lost those characteristics that make hill sheep valuable.

Apart from the exceptional necessities of war, small size is no objection in a sheep to-day. I have, indeed, seen small hill ewes make a wonderful price as early spring lamb! Then the lambs that can be bred from them on good lowland pasture are ideal for the modern trade. The man who has been successful in purchasing really thrifty hill sheep will never forget the delightful experience. I once secured a lot of hill lambs that fattened to perfection on old pasture during a Scottish winter. Hill ewes will thrive on winter keep where lowland ewes would grow scarecrow thin.

Milkiness is a quality that records itself in the growth and quality of lambs during their first month of life. It is bred in hard circumstances and improves, up to a point, with age. Unfortunately, as in cattle, it is difficult to get milk and meat qualities developed to perfection in the same sheep. An old shepherd said of the Cheviot breed, "If the Lord had only made two kinds of Cheviot—one for wethers and one for ewes!" By crossing hill ewes with Down lambs, either directly or through an intermediate cross, one may do something to repair the omissions of Providence. The ewe supplies the milk, and the ram—by the prepotency that pedigree provides—the mutton.

Fig. 2. NATIVE ENGLISH (Southdowns, Gloucestershire. The Southdown is the premier English mutton breed.)

Fig. 3. SCOTS INVADERS (Ewe flock mainly Half-breds, Rothamsted Experimental Station. The Scottish Half-bred is a useful grazing sheep that has found its feet in England.)

In breeding sheep there are two main points to be kept in mind—land and market, and it is equally disastrous to ignore the one as to forget the other. The farmer may sometimes be inclined to forget the market, but butchers and marketing enthusiasts are equally apt to forget the land. I think the best way out of what is often a dilemma is to breed sheep that the land will carry, and then by judicious crossing attempt to provide what the market desires. There is not the slightest doubt what the peace-time market does desire—a milk-lamb—that is to say, a lamb slaughtered while still on its mother's milk, killing out at 30–40 lb. for London and 40–50 lb. for the provinces. Customers' distaste for mutton has been powerful enough to kill the once-flourishing wether trade. It is damaging the trade for heavy, winter-fed hoggets. Yet to attempt to produce milk-lamb on all classes of land would be absurd. There must be a reasonably good chance of getting at least 70 per cent of lambs away before the end of June. On land where that cannot be done it is much sounder policy to ignore consumers' preference and go for weight.

Fortunately, in the all-important question of adapting sheep to land, perhaps the highest art in sheep husbandry, there is not only a choice of method but a wide choice of breed. There is practically no corner of Britain where some breed of British sheep under suitable management will not pay its way. There is one very sound rule in making a choice, and that is to keep the productivity of the sheep slightly below the capacity of the land. For example, if it were a doubtful question whether land would carry Scotch Half-bred or the smaller and less productive Cheviot I

Fig. 4. OXFORD'S PRIDE (Oxford Down Lambs, Gloucestershire.)

Fig. 5. SUFFOLK'S GLORY (Suffolk tegs: Mr. Wm. Woodgate, Woodbridge Suffolk.)

should always choose the Cheviot. Moreover, I believe it is always preferable to attempt to find a breed suitable to particular land, than to force land to support a particular breed.

Many of these adaptation problems were solved long ago. It is no accident that so many breeds are at their best in their native counties, for they were originally bred to suit them. When breeders defend certain old-fashioned breeds as being best suited to their district, there is probably much truth in their assertion. Breeds, however, are not only suited to locality but also to management systems. A breed that flourishes under the folding system may make a poor showing upon grass.

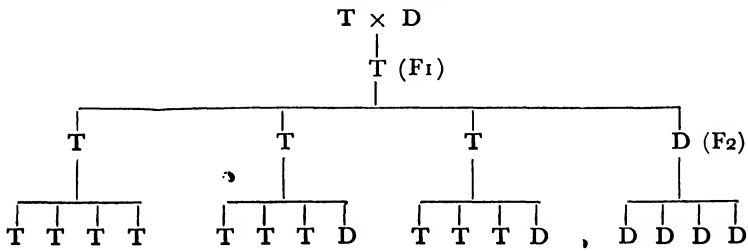
It probably does not pay to be a pioneer in sheep-breeding. Just as in company promotion it is said to pay best to come in on the second or third reconstruction, so in sheep-breeding the man who benefits is he who quickly follows up a neighbour's hard-won success. To introduce a new breed to a district is apt to be an expensive experiment. Except for those with great experience it is better to keep to the breed of sheep well-established in the neighbourhood. Men are suspicious of strange sheep, particularly in the sale-ring, and an alien breed may meet with a cool reception. I once saw a reputable consignment of one of our most famous English breeds exposed for sale in a rather remote locality. There wasn't a single bid for them, and as they were driven out unsold someone shouted, 'Take them to the pig-ring.'

Sheep-breeding has always been something of an art. It is likely, in the not-distant future, to become a science as well. Already the science of genetics has some useful and critical

contributions to make, worth the serious attention of the flock-master. Unless one has something of a mathematical mind it is not an easy science to comprehend, but some day we may all have to learn mathematics! In the meantime it is necessary to remember that like does not always breed like. There may be surprising exceptions, as Mendelism explains.

Mendel was an Austrian monk who employed a monk's spare time in crossing peas. He made most important discoveries, which the science of genetics has already immensely developed. For example, he found that if he crossed tall peas with dwarf peas, the progeny were not intermediate in length as might have been expected. *All* the progeny were tall and Mendel called tallness the *dominant* character, and dwarfness the *recessive* character.

Inbreeding (actually self-fertilization) of this first (F_1) generation of cross-bred peas gave the following result. Three-quarters of the number of this the second (F_2) generation were tall, and one quarter were dwarf. These dwarf (F_2) peas when inbred continued to produce only dwarf peas. Not so the tall (F_2) peas. One in three continued to produce only tall peas, but two in three produced peas both dwarf and tall, in the proportion of three tall to one dwarf. What happened can best be shown by a simple diagram, in which T stands for tallness and D for dwarfs.



Such a crossing result illustrates what is called the segregation of inherited characters. Of course that is a very simple instance, and I have very incompletely described its meaning. Things are not always so simple, and those who are interested must go to books on genetics for instruction. For example, the first cross (F1) may give an almost complete blend between two parents, although the progeny if inbred will show segregation. This segregation of characters can be observed in sheep.

If one crosses a Border Leicester ram with Cheviot ewes one gets a fairly uniform crop of lambs, although some will be very like Cheviots and others more like Border Leicesters. If, however, one crosses an Oxford Down ram with a Greyface (Border Leicester × Blackface) ewe, one gets an amazing sorting out or segregation of hereditary characters—so much so that the lamb crop is too diverse in appearance to make a decent appearance in the store ring. Some of the lambs would almost pass for Oxford Downs, others show more Blackface characters than their mothers.

Sometimes characters long hidden in each of two breeds may reappear on their crossing. I once crossed a rather good Oxford shearling with a lot of Greyface ewes. Some of the lambs dropped next spring were brown little creatures with pale bellies like some of the wild sheep one may see at the Zoo.

Without going into the deeper profundities of Mendelism, it is easy to realize the importance of Mendel's discoveries. Like certainly tends to beget like, but there are frequent and occasionally very surprising exceptions to this rule.

Mendel's laws of segregation of hereditary characters provide a reasoned explanation of the facts. When lambs appear that are unlike their parents it is no longer necessary to blame the devil or the neighbour's ram!

Of course the breeder deals quite effectively with the laws that Mendel and many brilliant disciples have laboured to make plain. Returning to the diagram and for the moment replacing peas by sheep, suppose one wanted to breed a race of sheep all of which were tall and none dwarf. One would naturally select tall sheep at the outset. Some of these would give satisfaction—all their lambs would be tall. Others would disappoint, since one out of every three lambs would be an unwanted dwarf, and such disappointing breeders would be culled.

Now that is exactly the way in which practical breeders set to work. In the first place they choose sheep that look good, and then they test that goodness by their breeding. Before a ram is extensively used he must be a good sheep in himself, and moreover he must be known to leave good lambs. The progeny test is essential to success. Personal brilliance does not invariably descend: the truth is written in the laws of Mendel, the disappointments of breeders, the history of kings.

Chapter Three

Controlling Fertility

On hill-grazings one lamb to each ewe is as much as can be expected—nor, indeed, is a heavier lamb crop desirable. It is rare for a ewe on hill-pasture to make a successful job of twin lambs, although after a winter in the lowlands she will do so with success. In arable sheep farming, on the other hand, with its higher overhead charges and heavier production costs, the more twins that can be obtained the better for the balance sheet. Fertility in ewes can be profoundly influenced by management, so that it is well to examine every detail of husbandry before attributing a poor lamb-crop to weather, the rams, or the ewes.

Certain breeds of sheep will take the ram at any time of year—even when suckling their lambs. The Merino will do so and so will the English Dorset Horn. In most breeds ewes that have the habit may very rarely be found, and no doubt by selection more breeds having this peculiarity could be established. It is, of course, a useful character in sheep, since a lamb-crop can be obtained at any time of

year, and three crops of lambs can be reared within two years if desired. For this reason the Dorset Horn has spread quite widely over Britain and is almost always used where out-of-season lamb is desired. It has been shown that if the Dorset Horn is mated with other breeds of sheep, then the cross will inherit the Dorset Horn property of taking the ram at any time of year.

All other British breeds have a definite mating season that extends from July or August to February or March. During April, May, and June the ewes do not come to the ram. The reason why this is so is not yet understood. The date of onset of the mating season depends upon breed, upon locality, and upon season. For several years after weaning ewes in June, I let rams run amongst them. The breed of ewe I used is the Greyface (Blackface ewe × Border Leicester ram). I found that in some years the ewes begin to take the ram in July and in other years not until the last week in August. The general custom is to mate this class of sheep in the month of October.

I have found that ewes behave rather differently in the earliest part of the mating season—in August—than they do later on—in October. In August the mating of a flock of ewes tends to be a much more condensed and rapid process than it is later. It is my experience that more than half the flock may come in heat in one day's time and that tupping, and consequently lambing, may be crowded into a very short period. I have also noticed both in the tupping and lambing of early-mated ewes that there seems to be a certain periodicity. Perhaps in a flock of fifty ewes ten will take the ram within three days; then a blank of

ten or twelve days occurs when nothing happens; then twenty ewes take the ram within a week; another gap and then the remainder mate. There seems, in fact to be a certain periodicity in early mating (I have theories to explain these observations, but the theories must wait on proof). Later in the mating season, in October, I have not noticed this periodicity. There are, of course, then also days when only a few ewes mate and other days when the rams are busy, but there is no clear sign of regularity. I always attributed variation in mating activity to weather conditions—and spoke of 'good tupping weather' until I began to mate ewes early. Now I am not so sure.

When ewes are early mated there are more missed services, a bigger percentage of ewes coming a second time to the ram. Later in the season service is more certain, but whether the cause lies in the ewe or in the ram I do not know. Maiden ewes are at least a month later in coming to the ram than mature ewes, and ewe hoggs are perhaps some four weeks later still.

It is of interest to-day, and possibly of commercial importance in the future, to learn that two American scientists have succeeded in making sheep breed out of their natural season. The method they used was to inject blood serum from a pregnant mare into ewes, twice, with a sixteen-day interval between injections. It sounds more like witchcraft than science, but it appears to have worked. It seems more than likely that within the next few years knowledge will be forthcoming by which any breed of sheep may be induced to breed at any time of year.

Whereas cows show when they are in heat by their restless

activity and by jumping on other cows, ewes may exhibit no special behaviour at all when the ram is absent. Sometimes ewes in heat will wander from the flock, and hill ewes may travel miles to the vicinity of the rams' paddock but they cannot usually be distinguished without the aid of teaser or of ram.

When a ewe comes into heat she will take the ram during a period which, on the average, lasts about thirty-six hours. She then goes off heat and does not come again until after an interval that may vary from fourteen to twenty-one days, but is usually seventeen.

There is art in preparing ewes for service. I like to see them falling back in condition for about four weeks before they go on to flushing food, and for that purpose keep them on the barest pasture available. They should go on to flushing food for a full week before rams are sent amongst them. The secret is to have the ewes in rapidly improving condition when they are served, and to secure that object it is usually necessary to let them down in condition and then bring them up again. Flushing the ewes is an old custom that experiment has shown to have a very real effect. It acts in two ways, firstly by bringing ewes rapidly to the tup, and secondly (and I believe this to be the more important action) by increasing the number of twins conceived. Because of this undoubted effect in increasing twinning, I avoid the flushing of maiden ewes or ewe hoggs, for they will do well if they rear one strong lamb. Various feeds may be used for flushing, but I prefer actively growing and succulent crop, especially clover aftermath.

Ewes should always be marked when served, and to secure

this object the ram must be keeled. For marking I use a mixture of linseed oil and red keel made into a thick paste. This paint will be plainly visible on the ewe's rump at lambing time. Rams should be smeared with this paint on the bare patch between the forelegs, and to do this effectively it is necessary to turn a ram up. Dabbing the paint on his breast is worse than useless for he will leave a bigger mark on the ewes he rubs against than on those he actually jumps.

If (as is sometimes done) the rams are picked up as the ewe flock passes their gate, many ewes will be jumped on and keeled which are not in heat at all. It is better that the ewes be well settled in a field when the rams are let in. The rams having been driven gently down to the field it is a good plan to leave them for a few minutes at the gate. The ewes in heat will come to meet them, and when the gate is opened the rams will get at once to work.

In order to avoid congestion and confusion at lambing time I believe in marking the ewes systematically, week by week. At the end of the first week ewes tupped are drawn out and marked red on the near shoulder; at the end of the second week marked red on the near flank; at the end of the third week left unmarked. The ram is then keeled blue, and the ewes mated marked in the same way at weekly intervals with blue paint (linseed oil and blue keel) instead of red. Then when spring comes, ewes can, if it is practicable, be drawn out in the proper order for lambing.

If maximum fertility is to be ensured, I think it a mistake to run the whole flock together during mating. That is sometimes done with the idea of giving frequent changes of

pasture to promote flushing action; but, in my experience, the ewes are too much disturbed by the rams pushing and fighting amongst them, and the rams are apt to waste their energies competing for some ewes while others are left untouched. I think smaller mating flocks of sixty or seventy ewes are best. An important point in securing a good lamb crop is to ensure that every ewe is served at the height of her heat.

I believe in putting old ewes with young rams and maiden ewes with experienced rams—and thought this was my own idea until I read in Shakespeare "to betray a she-lamb of a twelvemonth to a crooked-pated, old, cuckoldy ram, out of all seasonable match." The custom is evidently ancient and has good reason in it, for I have been surprised by the awkward wastefulness of ram lambs put among maiden ewes. Young ewes are often timid and shy but an old ewe stands like a rock.

Ewes should be carefully herded whilst mating is in progress. They should be gathered around the rams once, if not twice in the day. Such a precaution is especially necessary with maiden ewes, which are more likely to be missed than older ewes that have the experience to seek the ram when they come in heat.

These simple rules of management will reduce the number of barren ewes and increase the number of ewes that have twins. They allow a ewe to express the fertility that is in her, but fertility has its limits and is variable from ewe to ewe. Some ewes produce a single lamb each and every year, and no amount of flushing or of careful management will change the habit. Other ewes invariably have twins, and

others run constantly to triplets. It is very rare for a ewe to have a single in one year and triplets in another. Nevertheless, food has a tremendous influence on fertility, as is seen when cast hill ewes are brought down to arable ground. I have known such ewes after producing five successive singles on the hill conceive triplets after one month on arable pasture.

Sheep breeds differ in fertility: sufficient careful experiments have been performed to show that. Personal experience, also, has convinced me that the Border Leicester, for example, is a breed of exceptional fertility and that it passes on this characteristic to its crosses. Yet the influence of breed can be easily exaggerated. Some of the lambing percentages I have seen quoted for arable flocks in England strike me as poor, yet I have lambed sheep of the same breeds under conditions of Border arable farming and got quadruplets from them. If I were asked what were the important factors regulating the fertility of ewes, I should answer from my own experience that first came the individuality of the ewe, secondly feed and management, and last and least important—breed.

Occasionally a ewe will not settle to one ram and yet will immediately conceive to another. That is a point worth remembering before culling a ewe as an uncertain breeder. I have seen ewes go on taking the ram day after day without settling and without the customary seventeen-day interval of rest. Such ewes are diseased and should be culled. I once had a ewe which was hermaphrodite. She had the external organs of the ewe, but behaved more like a ram, fighting with the rams and jumping the other ewes. She upset the whole flock—and went straight to the butcher.

A ewe may conceive to two rams. I saw a very neat instance of that in the flock of a neighbour who keeps only the one breed of sheep—cheap ones. A Cheviot ewe was tupped by both a Cheviot and an Oxford ram, and in the spring she dropped two lambs—one pure Cheviot, the other Oxford cross.

There is an old breeding superstition, which still persists, that the colour of a lamb is influenced by what the ewe is looking at during conception, regardless of the fact that a green lamb has never been born. Another superstition is that a ewe once crossed with another breed will never again breed pure. I think both these superstitions are used by breeders of pure-bred stock to explain away some of the impurities which occasionally appear even in the best regulated flocks. I was once strolling through a field of new-born lambs with a successful breeder of pedigreed sheep. We most awkwardly came on a lamb that looked more like a kid than a flock-book entry. My friend asked me whether a goat could mate with a sheep, but I knew there was no billie-goat nearer than twenty miles, and so, as a matter of fact, did he.

That the ram is half the flock is an old saying that is probably a true maxim for the owner of a pedigree stock struggling to retain and improve on the finer points of a breed. It is not so true for the breeder of commercial sheep, to whom a flock of strong milky ewes is of greater value than the finest ram. Many flockmasters do not appear to agree with me in this. I have known many hill farmers who think that half-a-dozen well-bred rams will raise the value of stock on a third-class grazing. I also once thought, that

but experience has taught me that good blood is wasted on bare ground. A ram may easily be too good for the job he is asked to do.

In many ways it is a pity that ram-breeding has become so specialized a job. In these hard times there is a tendency for it to cease to be a job at all, and to become a rich man's hobby. It would, I think, be to the benefit of the country's sheep if every pedigree breeder ran a few commercial flocks as well. There would then be less talk of the amount of wool on a ram's head and more of his constitution and ability to live under field conditions.

Rams are always forced before sale, and that forcing tendency seems to be on the increase. Even in the north, rams are being sold as lambs. Far fewer shearlings are exposed for sale now than twenty years ago, and the lambs of to-day have the size and substance of the shearlings of yesterday. I do not believe that there has been a corresponding increase in the early-maturing qualities of sheep breeds during that time, but the art of forcing has advanced.

I have seen something of the rearing of pedigreed sheep of hill breeds. These are usually sold as shearlings. The lambs are put into a shed at the beginning of winter and fed like fattening bullocks. They are shorn in mid-winter, get little exercise and grow tame and lethargic as barn-door fowls. Then after sale they are asked to roam the hills in quest of ewes, often to fall into a bog-hole which they probably mistake for a stable bucket! I do think that the sires of hill sheep should see something of hills in their youth.

Ram breeders are not altogether to blame for these arti-

ficial conditions. There is always much criticism of the colouring and trimming of sheep for sale, but I have yet to see a ram in natural condition make its full value. Then again, a sheep will not show its inherited capacity for producing mutton and wool unless it gets as much food as it can use. Still, when hill sheep are reared in sheds there is surely something wrong with our methods!

Things being as they are, however, it is always necessary to remember that a newly-bought ram comes from a very good home. It does not do to bring him too quickly to the facing of life's hard realities. It is well known that ewes should be in improving condition when they come to the ram, but there is less and too little known of what the condition of a ram should be when he meets the ewes. In ninety-nine cases out of a hundred he is losing condition all through tupping. Until I hear of facts to prove the contrary I refuse to believe that is likely to improve his lamb-getting powers. I therefore believe in being good to rams and particularly to those that have newly come from pure-bred flocks and cakes and ale. It is not always easy to feed a ram when he is busy amongst the ewes. I had one, and a rare worker he was, that never seemed to eat anything until tupping was past. Then he was lean as a rake and ate like a horse. But most rams are glad enough to see the feeding box. I like to have a small cattle feeding box for each ram and to give him half a pound each day of a mixture of linseed, oats and bran. Bran is of especial importance because it is laxative and a ram will not work well unless his bowels are free. It is also a food that has been shown to increase fertility in stallions. Raw eggs are also known

to be good for breeding horses and might well be used more widely among rams.

Sound feet in rams are as important as sound feeding, for a lame ram at mating is a nuisance and a cause of loss. I know that there are many kinds of foot-rot, and more opinions on its cause and treatment than there are kinds. My own view is that it is one of the most easily *prevented* of sheep diseases, but one of the most difficult to *cure*. To keep rams sound I believe in a weekly splatter through the bluestone (copper sulphate) or arsenical foot-bath; that, and regular exercise on hard roads. I like to see rams doing regular road-work for a fortnight before they go among the ewes. It is good for their feet, their muscles and their tempers, and keeping them at a gentle trot is a fine job for autumn visitors to the farm.

Before service, rams should be kept in a soundly fenced field. Apart from the unwanted possibility of out-of-season lamb they never settle should they once break free, continually standing at gate or hedge while they should be grazing. It is therefore well to ensure that rams are securely held until they are needed.

How many ewes should a ram be expected to serve? That, in the first place depends upon the system on which rams are run with the ewes. I know of three methods. One is to run rams continually with ewes, what one may call the natural method; another is to take the rams out either by day or by night, a common custom in America; a third is to use teasers and bring the running ewes in to the ram. I am in favour of the first method every time, although

others think differently. I like it because it is nearest to Nature, and I believe that Nature knows a lot more about breeding than we do. Taking the rams from the ewes by night or by day is supposed to rest the rams, thus allowing them to serve more ewes. I don't believe it does. A ram will settle best beside the ewes he has tupped. To take him forcibly away is to upset his temper and to have him irritable until he returns. The newly-tupped ewes, too, are upset by the absence of the ram. I always notice that they like to stay close beside him for anything up to twenty-four hours after they are served. Anyone who has watched sheep closely knows that a ram and ewe have what one can only term an affection for each other after they have mated.

I don't believe in teasers. The word was appropriately coined. More than that, they are, in my experience, unreliable. To tie an apron round a rig or lamb and expect him to act as a detective is asking too much of him. He does his job perfectly well until the sacking has damaged his extremely sensitive male organ, then he tires. Teasers, therefore, will miss ewes that are in heat. If the teaser method is employed I think it strongly advisable to get a few cheap rams vasectomized by the vet. Vasectomy means cutting the *vas deferens*, the tube which connects testicle and penis and along which the semen passes. Vasectomized rams behave in every way like perfect rams, except that they are infertile and can leave no lambs.

Bringing running ewes in to a stud ram is in any case a hashing business. The ewes are scared and upset and sometimes refuse to stand. I do not think they are so certain

to conceive. Once, for a special purpose, I used this method and was left with a bigger percentage of barren ewes than I have ever known before or since. I partly blame the unreliability of teasers but partly also the unsettling of the ewes.

My preference and my practice, therefore, is to run the rams continually with the ewes, and the number of ewes I allow is thirty to a ram lamb, forty to a shearling or mature ram, thirty to an aged ram. Of course, a ram is capable of serving far more ewes during a season, but the important point is not how many he can serve in a season, but the number he can settle in a day, and ten ewes may tup to-day where only one will tup to-morrow.

As I have said, I like to split the ewe flock up into lots of sixty to eighty ewes and to run two rams with each lot. Rams do not fight much under these conditions. A ram is much less pugnacious after serving a few ewes than when kept with other rams. Even so, to avoid accidents, I try as far as possible to match the rams, shearling with shearling, aged ram with aged ram, and so on. I make one exception to that rule. When a newly-bought ram is to be used I put it with a ram which I know to leave good lambs. Then I can apply the progeny test to useful purpose. An example will show what I mean. I once bought a shearling out of a pedigreed flock and mated him with Greyface ewes. He left black lambs, brown lambs, and grey lambs, although he had a fine pink skin himself. As the ram he was working with had never left a coloured lamb, the culprit was promptly culled. Had he been working with another ram of unknown performance, perhaps with a bit of black about him, the

wrong ram might have been disposed of and the offender retained.

I like to have at least two rams in reserve. They can serve a double purpose. In the first place, tupping may go on so hard that it is useful and advisable to give the spare rams a few ewes each to relieve the regular rams. Again, a ram may die, injure himself, or prove a poor worker. New rams are very difficult to pick up once the sales are past, and a neighbour approached for temporary assistance may prefer a hard bargain to a kindly deed. In fact, spare rams give a comfortable sense of security during mating, and almost always come in useful for work at home or for hire abroad.

Rams, particularly newly-bought rams, should be carefully watched during their first few days of service. If a ram is not working properly something must be done at once. It is a mistake to discard such rams as useless, for in many instances they can be made to work. The cause of many temporary mating difficulties is psychological—which sounds a strange thing to say of sheep, though it is true. Shearlings, unused as lambs, are most apt to have this trouble. That is I think, because rams kept together for a year are apt to adopt unnatural practices and become uninterested in ewes. Nevertheless, if once their natural instinct is roused they may work well enough and leave good lambs, although I would not keep such a ram a second year. To rouse the unwilling ram pen him beside a running ewe. Try to get his temper up. Should he still refuse to work, bring another ram in beside him to do his job. He usually follows suit. Of course, I must add that I make sure the ram is fit and properly

formed in every way before putting him to these tests. In my experience a ram once roused to work will go on working although he is seldom quite so keen as a normal ram. Lambs seldom give trouble in this way; it is a fault of maiden shearlings.

Chapter Four

Wintering Ewes

A ewe carries her lamb on the average for 147 days. Some ewes may drop their lambs in as short a time as 142 days, others carry them for as long as 152 days. It is therefore wise to bring the ewe flock into lambing quarters 140 days or 20 weeks after the rams have been put out. During that five-months period a ewe has to keep herself, build up her lamb or lambs and form udder and milk. That is a big job to do well on winter keep, but fortunately ewes in lamb make rather more economical use of what they get than those that are barren. Pregnancy appears to act as a stimulus to digestion. That is a wise provision of Nature, as were it not so it is difficult to see how hill ewes could come through the winter at all.

A hill ewe carrying her lamb will lose anything up to a third of her weight between autumn and spring, but a barren ewe will lose more. Nevertheless, in pregnant hill ewes a great part of the lamb's substance is formed from the ewe's own body. What seems to happen with a pregnant ewe is this. If reasonably well fed she will form her lambs

out of the food she gets, but if she is half-starved she sacrifices her own body to form the lambs. In younger ewes that are still growing this sacrifice is not so natural nor so easily made, and the lamb may suffer and abortion result.

I do not think there is any real harm in hill ewes losing condition during winter provided the loss does not go too far. After all, the fat that we have come to regard as the butcher's perquisite is really reserve food to be used in times of nutritional stress. So, when hill ewes become fat in autumn and lean by the next spring they are merely doing a very natural thing. It is wise, however, to have them reasonably fat in autumn, and while that is mainly a question of weather it also depends upon the date they are weaned. When flockmasters find that their lambs are backward they are often tempted to keep them until a later sale. It is well to remember that this practice, by giving the ewes a shorter time to pull up before winter, is apt to damage the succeeding year's crop of lambs. Hill ewes to be tupped in November should have the whole of September and October in which to pull up: and what good use a hill ewe makes of her leisure! The ewes can be helped if the hill is cleared as much and as early as possible by selling cast ewes at the first opportunity and by getting the ewe hoggs to their wintering at the earliest possible date. That gives the ewes that are to be wintered on the hill the best chance of utilizing what the hill provides. The less additional help they get during winter the better for the stock and for the hill.

I much prefer to see hill ewes fed naturally. If artificial feeding is practised during winter it is quite true that more

ewes can be carried, that their lambs will be bigger, and that there will be more of them to sell: but food costs money, and expenditure on grain or cake will be much better repaid by giving it to arable sheep than by pampering a hill flock. A child that is always getting cake will turn up its nose at bread and butter! In the same way hill ewes that have once learnt where the feeding troughs lie are less willing to rake the sheep-walks for natural fodder. Again, artificial feeding interferes with natural selection, which is more salutary although often contrary to that of the flockmaster. Watch a hill farmer select his ewe-stock to keep! He chooses the big lambs, the lambs with the right colour of face and quality of wool. Nature does something better even than that. Come a hard winter she will prune off the strains of sheep that are too big for the ground, that are uneconomical feeders or without resistance to disease. The flockmaster and natural selection together will achieve a fair compromise in which the typical characters of a breed are retained in strains of sheep well suited to the ground.

If hand-feeding of hill sheep is overdone they become large and more productive, but lazier and less economical to keep. In other words, if lowland sheep-farming practices are carried up the hill, hill sheep will soon come to have the characters of lowland sheep and lose the special virtues of being hardy, independent, and easily kept that give hill breeds their special value. There is really only one justification for feeding hill ewes, and that is when frost turns half-melted snow into an impenetrable board. As long as there is some roughness on the hill and ewes can scrape through snow to it, they will manage wonderfully for them-

selves, but if the snow is hard and hoofs won't work then the cover must come off the haystack. It is a great mistake to think of hay only when it is immediately needed. If hard storms come hay becomes scarce and dear. More important still, it may be impossible to cart it over drifted roads. Many experienced flockmasters have impressed upon me the necessity of having ample hay secured at the beginning of each winter. In an open winter it may never be used, but it is the iron rations of hill sheep, to be used only in emergency.

Spring is the critical time for hill ewes. They are leanest then, yet heavy in lamb. They may lose strength and losses may occur. That is when a hill grazing is put to the test. A good hill grazing is rich in that special kind of cotton grass called 'draw-moss,' in sedges, and in evergreen rushes. On such grazings a late year for draw-moss is a bad year for sheep. There are other hill grazings, maybe they are verdant valleys in mid-summer, but black and bare in spring. These are called the black hills and are deadly for sheep. Personally, I should never venture to rent a sheep-grazing unless I knew something of its appearance in February and March, for the secret of successful wintering of hill ewes is spring grazing when winter is done. A hill without rough vegetation to break snow and without damp places for early hill plants to grow is a bad hill on which to winter hill ewes, and it is well to remember that they can respectively be too easily burnt or drained away.

While hill ewes should be left as much as possible to their natural ways, this is not the case with lowland sheep. With these, whether the system under which they are kept is mainly grass land or wholly arable, the conditions are no

longer natural and the shepherd's eye must guide the progress of the flock. I have an ideal to aim at in the wintering of lowland ewes. I like to see the occasional barren ewe fit for the butcher in spring, for then I am sure that ewes carrying triplets or twins are not too lean. If the barren ewes are thin (there should be no more than one or two per cent of them) ewes heavily in lamb will have had too much substance pulled out of their frames. Particularly where milk lamb production is aimed at, the ewes should not be over lean when they are lambed, and they must have plenty of milk. The udder begins to form about two months before the ewes lamb, so that if they are to milk to capacity they must be fed well from that time onwards. I have always thought that even intensively-managed ewes need very little help for the first two-and-a-half to three months of pregnancy. Ewes lambing 180 to 190 per cent, for example, will do perfectly well on winter pastures during that time. After that they need other foods.

Roots of any description can be very easily overdone with in-lamb ewes. In certain districts there is still a tendency to treat ewes as though they were being prepared for the butcher instead of the lambing-pen, and therefore, among other errors of management, to give them too many roots. I know nothing better for newly-lambed ewes than swedes or mangolds, but they are better used then than before the ewes have lambed. Turnips, white or yellow, are much better, but they, too, should be fed in moderation: 5 lb. per head daily is quite enough. It is well to remember that a ewe near lambing is well filled up inside with womb and lambs, and that she has no great amount of room

for bulky food. That is why ½–1 lb. of concentrates is so valuable.

The concentrates should be given first thing in the morning while the ewes are empty. A mixture such as bran and oats, two parts each, with linseed, soya or earth-nut one part, is best. I have a great belief in the value of bran for sheep during winter (in summer it may scour) and oats are just about the safest food one can give. It is of first importance with in-lamb ewes to see that any concentrates they receive are fresh, dry, and free from mould. Really well-cured hay with a proportion (perhaps a third) of clover in it is good for the ewes, but not more than 1 lb. per head daily. Pregnant ewes, even in the lowlands, are much better for doing some foraging for themselves. If there is a stretch of heath or common available, a turn over it each day will save lives.

There are two rules of the utmost value in the wintering of lowland ewes. One is to give them a variety of food each day, the other to give them daily exercise. Monotony of food and inactivity are, I think, the two main causes of disaster, for it will take a lot to dislodge a lamb, before its time, from a ewe that has been well-managed and properly fed.

Chapter Five

Preparing for Lambing

The imminence of lambing time has excitement. What secrets and surprises, pleasant or unpleasant, are hid in the wombs of the ewes? Will the old dun-faced ewe have triplets again this year? Will the snow hold off and the young grass come in time? When the excitement has worn off I like to meet the shepherd at the lee side of a dyke and discuss every detail of what lies ahead.

First of all, what field is most suitable for lambing and where must the lambing-pen be placed? On the first farm where I ever lambed sheep the building of a lambing-pen was a ceremonial occasion and a job of importance. Thick fencing posts, wooden rails, wire netting and bunched wheat straw were used to build an imposing structure between the stackyard and the house. Such lambing sheds are like snowmen, a bonny sight in hard weather, but dirty and dismal when the days are wet. They are undoubtedly convenient, with the more delicate breeds of sheep they are probably necessary, but on principle I don't like them. They are difficult to keep clean and still more difficult to

move, and there are occasions even in the best-managed lambings when it is advantageous to move quickly to fresh ground.

The lambing-field, too, should be a temporary rather than a permanent institution. I like to spend some time in choosing the most suitable field for the purpose, because a lot depends upon its suitability. My ideal field would be one of permanent pasture with a gentle slope and southern exposure, well-drained, well-fenced and sheltered. It would be within easy sight and reach of the steading, some distance from a road where traffic passes, and it should have one or two fields of young grass or other fresh crop immediately adjacent. Of all these qualities I should say the most important was that it should be constantly under the master's eye.

When the most suitable field has been chosen in which to make a start, others can be selected as first, second and third reserve. Then the most suitable field in which to face severe storms from north or east, and in some districts the west, should be selected. The purpose of the reserve fields is to make a quick shift should disease appear, leaving the diseased sheep behind.

Night shelters, I think, should be easily movable. Except in hill sheep, it always pays to pen lambing sheep at night, but the structure erected should be one that can be taken down and re-erected on fresh ground within an afternoon. Light fencing stobs, wire netting and bunched straw serve the purpose well. The site chosen must above all else be dry. The most suitable place for the purpose I was ever fortunate enough to find was a sloping piece of

moory ground where a fir plantation had once stood. Whenever the pen becomes obviously dirty, I shift it.

I do not believe in field-shelters for young lambs. Plantations, thick hedges and stone walls mean money saved, but it is those artificial wind-breaks of straw dotted over a field to which I refer. Low-ground sheep are quite likely to select the windy side of such a shelter in which to lie, and the ground about them gets trampled and foul. It sounds an insult to the sheep's intelligence, but I have often seen ewe and lamb play pitiful hide and seek round these shelters. When the ewe was on one side the lamb was on the other, and when the ewe came round the corner away the lamb would go. The remembrance of a tragedy reminds me that small-meshed wire-netting must always be used where young lambs are, otherwise a lamb may be lost by strangulation.

I like to see good store of roots and hay beside the lambing fields, for grass is a thing as fickle as a credit balance. I like to see cake house and bins filled with oats and bran and linseed cake. If there is any better trough mixture for lambing ewes than 1 part oats, 1 part bran, ½ part linseed, I have yet to find it. Ewes with young lambs drink a surprising amount of water. If a heifer calves when lambing begins, so much the better.

I come to the all-important question of the shepherd. I much prefer a married man in charge of lambing ewes. That has nothing to do with the fact that I am a married man myself, but we all know where a young man's fancy is likely to turn in spring and we want the shepherd's mind to be wholly on his sheep. Then a shepherd's wife of the

right type (getting scarcer, I fear) will take a big hand in the lambing. She will be prepared to find meat for man or sheep at any hour of the day or night, and her kitchen—like her heart—will be open to any weak or ailing lamb.

Lambing is a hard job and a good shepherd will take pride in his hardiness. One I knew was proud of the fact that he never shaved, never took off his boots, and lost a stone and a half in weight every lambing-time. I don't hold with bonuses for lambs reared or for twins, because that is to reward or penalize a shepherd for the deeds or misdeeds of weather or of rams. Besides, a man who puts a price on the life of a lamb should keep a shop!

I have waited until the end before writing of medicines, because I believe the medicine chest to be the least useful and certainly the most disheartening part of a shepherd's equipment. In part it may be national prejudice, but I firmly believe that I have saved more lambs by patience, warmth and whisky than by any other means. I also like to have on hand a bottle of castor-oil, one of iodine tincture, one of laudanum, one of sweet spirits of nitre, rubber teats and keel marking sticks. I like to be sure that all the stable lamps are working well and that there is paraffin in store. It may be old-fashioned, but I don't like petrol lamps in straw-littered lambing pens: I once saw, and smelt, a lambing shed go up in flames. Ready access to a fire-side, however, is worth at least a hundred pounds in a flock of twenty score ewes. Warmth, properly used, will save more lambs than all the medicines in the world. A farmhouse at lambing, at least the farm kitchen, should be a first-

aid station for the lambing flock. Feminine resistance to this intrusion is rare. 'Good' is perhaps an old-fashioned-sounding word to-day, but I have never yet met what I might call a good woman who would not lend a ready hand to the saving of a weakly lamb.

Chapter Six

Lambing

A ewe about to lamb behaves in a particular way which it is well to understand. Her first instinct is to leave the flock and to get away by herself. That is the instinct of all wild animals when birth pains come upon them. If she can find an open gate or a hedge-gap she may wander far enough, but usually the boundaries of the field restrain her. She then finds some corner and begins to scrape a bed with her fore-feet, in a smooth grass field a mere convention, but no doubt of value on the rougher ground where wild sheep had their home. She will be restless, meantime, and bleat a good deal. She then lies down and begins to strain and heave, or to work, as shepherds say. As the pains come on her she will raise her head with nose pointing to the sky. That is a useful sign for a shepherd to look for, since a ewe lying with up-pointed head is one about to lamb.

The appearance of the bag of water is the first result of a ewe's labouring. She will often rise and turn round and round after the swinging bag until it bursts, when she stoops

to lick the spilled water. Then she will lie down again where the waters have spilt and labour, rising and turning at intervals until the lamb or lambs are born.

That is a brief picture of a lambing proceeding naturally to a successful ending, but of course matters may go wrong at any stage. In the first place, the ewe may become attracted by another ewe's lamb and forget her own bodily condition in a mental obsession for adoption. This complication may occur at any stage of her lambing. I have seen a ewe have this adoption mania for a whole fortnight before she finally lambed, but usually it does not arise until a ewe has licked the water from the burst bag. It may make matters very difficult for the shepherd. The ewe, perhaps with her own lamb partly born, will gallop wildly down the field to be greeted by a bleating lamb tottering to meet her. She will lick and mutter over the strange lamb, giving it suck, and behaving in every way as though it were her own. She will butt away the real mother with great fury, while perhaps her own lamb remains partly born. I have even seen a ewe leave her bed to lick the partly born lamb of another ewe. This strange perversion of instinct may bring a lambing-field to pitiable confusion. I remember one day finding the shepherd with crook outstretched and one dog on either side of him guarding a ewe and her lamb from five frenzied ewes all in various stages of their labour. It was like pictures of the charging French cavalry before the British squares at Waterloo! I think this perversion of maternal instinct is quite readily explained. A lambing ewe possesses a chain of natural instincts, one leading on to another and designed for the benefit of the unborn

lamb. These instincts are in this order: 1, Isolation; 2, Making a bed; 3, Bearing the lamb; 4, Cleaning the lamb. If the first link in this chain—isolation—is allowed to occur, then the behaviour of the ewe follows a normal routine. As complete isolation is impossible under conditions of low-ground sheep-farming, the proper sequence may be interrupted and a ewe proceed to stage 4—the lamb-cleaning—before she has borne her own lamb. This perversion of instinct I have called 'lamb-theft,' and it is fortunately amenable to prevention and has its natural cure.

In the first place, the instinct for isolation can be partially gratified by having as few ewes as possible, and particularly as few lambed ewes as possible in the lambing field at any one time. This result can be secured by proper marking of ewes at mating time as described in an earlier chapter (p. 34), by removing ewes with their young lambs to another field as quickly as possible, and by ensuring that two or more ewes do not make their lambing beds in the same corner of the field. It is possible and advisable to assist ewes in their choice of lambing site by driving them gently to some quiet place and perhaps better by driving other ewes from their vicinity. Once a ewe has scraped her bed and more particularly when her waters are spilt she should never be shifted unless absolutely necessary.

Secondly, the desire for 'lamb-theft' ceases immediately once a ewe has lambed. No matter how avid she may have been for another ewe's lamb, once her own lamb is born the craving ceases, so that it is only a question of tiding things over for a little time. I have two rules for dealing with a 'lamb-thieving' ewe. If she is ready to

lamb—lamb her by hand. If she is not ready, put her in a shed by herself until she has lambed herself. It is worse than useless to put her in another field, for she will gallop around, jump at fences, get caught in hedges until she is exhausted, all in an effort to return to the lamb of her adoption.

Lamb-theft is particularly apt to occur when a lamb has presented itself with its front legs twisted backwards. With such a presentation the lamb's head is born first and then the body sticks; but once the head is free the severity of the ewe's pain is so much lessened that, unless the body quickly follows, the ewe may imagine that her lamb has been dropped and go in search of it.

When an old ewe has become interested in other ewes' lambs, days, or even weeks, before her own is due, she becomes a disturbing influence to the whole lambing flock, particularly at night. It is best to get her out of sight and sound of young lambs by allowing her to run among barren sheep of any description in a well-fenced field. Once the stimulation to her maternal instincts is removed she will settle quietly down until her time is come.

Lamb-theft, while not serious if the facts are understood and the remedies known, can be a source of loss and unending worry to an inexperienced shepherd or to one lacking in resource.

A ewe may have many difficulties in the actual lambing. Malpresentation of lambs is a subject on which little is known and which would repay further study. Although I have no figures to prove the case, I am fairly certain that malpresentations are more common in some seasons than

in others, and in some flocks than others. The usual reasons advanced in explanation are that the sheep have been chased by dogs, have been crushed in gateways or strained in traversing muddied ground: but there is more in it than that. Dogs, gates and mud will lead to abortion and malpresentation in a flock disposed that way, but the disposition varies. I suspect there is some weakness in the tone of the womb, perhaps due to nutritional factors, which makes malpresentation common. Whatever its cause it must be dealt with carefully and quickly.

The correct way for a lamb to come is, of course, with its head laid between outstretched forelegs like a prostrate sun-worshipper. Whenever there is difficulty in passage, either head or forelegs get forced out of position. One or both legs may be bent backwards and the lamb appears with one leg and the head showing, or with the head showing and no legs visible. The first malpresentation—head and one leg showing—is easily dealt with by pulling down the second leg and delivering normally. The second malpresentation—head alone showing—is more difficult. The ewe is often awkward to catch as she can run well once the lamb's head is out. Then the lamb's head swells rather quickly if the ewe's passage is tight. A point to remember is that the lamb will not suffocate, since it is still drawing aerated blood through its cord, so that no desperate haste is required in its delivery. The remedy is to bring down first one leg and then the other, a task which often requires patience. I do not believe in attempting to force the head back, as some books advise.

Sometimes the lamb comes hind-legs first. There are

two points about delivering such a lamb. First—speed is necessary, since the lamb is usually pressing on its own cord which carries the life-blood to it until it is fully born and can breathe. Second—the lamb's body should be twisted round as it is delivered so that its backbone is turned away from and until opposite that of the ewe, otherwise the lamb's belly is apt to be badly crushed against the lower bones of the ewe's passage. I have noticed that when one lamb comes hind-legs first its twin is apt to come the same way.

A lamb may present by the breech. In such a case the breech should be pushed back and the hind-legs brought down.

There can be some rare complications when twins start coming down together. I have seen the head of one lamb present between the forelegs of the other, the foreleg of one lamb come down beside the hind-leg of the other. Such cases can only be dealt with by getting one's hand right inside the ewe's womb and that's where the danger begins. So far I have dealt only with those malpresentations which can be corrected by manipulation within the ewe's passage without entering the womb. I am always loath to put my hand within what can only be regarded as an open and easily infected wound, and my hands are much cleaner than those of most shepherds. With a rub of lysol or carbolic and trusting to luck a shepherd will use his hand in a cavity where even the most skilful veterinary surgeon would be fearful of consequences. In most cases the shepherd secures the lamb, dead or alive, and the ewe succumbs to inflammation a few days later. There is no doubt that if shepherds

put on a boiled rubber glove before exploring the womb (in no other case does he need one) the lives of many ewes would be saved. I shall not attempt to describe or illustrate what can be done when the womb is entered, for illustration appeals to sight, and within the womb one must depend upon touch. My own practice is to introduce my right hand into the womb while pressing it down towards me by my left hand dug well into the sheep's belly. Then I feel about until I am quite certain as to how the lamb or lambs are lying, and what is interfering with the delivery. I neither tug nor push until I am reasonably sure of what I am doing. In general I press back head, flank or breech, and pull down legs. Once a leg is safely in the ewe's passage there is always something to pull on.

Sometimes the womb is not sufficiently opened up to admit a hand. In such a case one must wait. I once waited four days and delivered a live lamb with safety to the ewe.

In desperate cases it is well to remember that many healthy lambs have been delivered in the manner of Caesar's birth.

There is always the difficulty of knowing just when a ewe should be caught and assisted. One can tell little by the time a ewe has been in labour. A single lamb takes longer to deliver than a twin, a big lamb longer than a small. So a ewe may work for a very long time and yet everything be normal. To interfere in such cases is to court disaster, because the shepherd's pulling plus the ewe's heaving may easily kill a big lamb tightly wedged in the ewe's passage. It may kill the lamb and may damage the ewe. Yet left to herself such a ewe delivers herself normally.

There are three occasions on which I always interfere. The first is where I see that the presentation is wrong; the second is where the ewe, after working hard, ceases to work; the third is where a ewe refuses to settle to work after her bag is burst. In such cases there is almost always something wrong and examination is required.

Suppose a ewe, having been caught, is found to be lambing normally? If she is not opened up, leave her. If she is well opened then lamb her. To attempt to lamb a ewe that is unopened is only justifiable in the rarest cases; but if a ewe is ready to lamb it is better to be done with the job once she is caught. Handling upsets a ewe and she is apt to hang about too long before settling again. I have lost lambs in that way.

When I have lambed a ewe I always hold her down until she has licked her lamb, otherwise she may spring up and leave it, a disaster particularly apt to happen with maiden ewes. Once a ewe has licked her lamb she is most unlikely to leave it. Even so, in order to avoid further trouble, I prefer to leave a ewe lying, stealing quietly away. With a nervous sheep it is better for no man or dog to be near when she first rises to her feet after lambing.

Finally, when one has caught a ewe it is always worth while drawing milk off both teats to make sure they are functioning.

Chapter Seven

The Young Lambs

A lamb born weak may grow to be strong —if it lives. Spartan principles that would allow only the stronger lambs to live are in my view unsound sheep practice, for my experience has been that a lamb that was almost lifeless at birth may make a top price when sale time comes.

Many good single lambs are temporarily exhausted by a prolonged and difficult birth; twin lambs are sometimes weak because they have been dropped a day or two before their time. In neither case is the lamb necessarily degenerate or imperfect in any way. If it can be persuaded to survive its first day of life it may turn out a good sheep in the end.

First-aid measures in the field should not be too prolonged, because cold, more than anything else, is death to young lambs. When a newly-born lamb does not breathe I rub it quickly with a wisp of straw or an old sack, slap it firmly on the buttocks and then give it artificial respiration by pressing its chest rhythmically in and out at intervals of a few seconds. I have found that method more successful

Fig. 6. DORSET'S CONTRIBUTION (Dorset Horn ewes. The Dorset Horn ewe differs from other English breeds in breeding at any season of the year.)

Fig. 7. OUT-OF-SEASON LAMB (Dorset Horn ewes with lambs in March: Moulton Farm Institute, Northamptonshire. Dorset Horn ewes may lamb at any season.)

Fig. 8. AN ELLIOT'S BREEDING (Cheviot ewes: Mr. John Elliot, Blackhaugh, Selkirkshire.)

than blowing down the lamb's throat to inflate its lungs, although I have done that too. The important thing is to get the lamb into warmth and shelter without delay: as long as its heart continues to beat it may revive with heat.

New-born lambs must be carried in a special way, in the shelter of coat or jacket and supported in the crook of one's arm. I once saw a shepherd carrying weak twins, swinging one in each hand by the forelegs as though they were trapped rabbits. He might as well have tied ropes round their necks and been done with it. Nothing kills a weakly lamb quicker than carrying it by the forelegs. The lungs and heart are compressed, blood leaves the brain, the whole body is exposed to cold. Sheltered by a coat and tucked up in one's arm, a lamb has the best chance to hold what life is in it.

The kitchen of a farmer's or shepherd's house should be the casualty clearing station of a lambing flock. The warmth of its fire may mean a hundred pounds. Lambs taken there should be rubbed dry, wrapped in a warmed sack and laid before the fire. Sometimes an apparently lifeless lamb may be brought back to life by a brief spell in the oven's heat. I don't suppose there are many modern grates in farm kitchens, and it would be a bad thing for the lambs if there were. When heat has done its good work the lamb starts floundering about the floor in search of its land legs. That is the time to give it its first drink. I was taught that the best drink for a young lamb was cow's milk with the cream skimmed off and diluted with warm water. I think I have found a better: a cup of warm water about blood-heat,

to which has been added a tablespoonful of glucose (sugar in its most easily digestible form) and a teaspoonful of whisky. That will help a lamb to get strength without burdening its stomach with a curd it is scarcely fit to digest.

When lambs are able to roam about the kitchen they can be put out to the ewe in the shelter of some warm shed. They should not go straight back to the field, particularly if night is coming on. If the lamb has been some time from its dam she may be unwilling to take it at first and this is more likely when the lamb is one of twins. I think it is always wise to take both twins from the mother should one require attention in the house, then both lambs come back with an equal claim to her affections.

That brings me to the question of ewes refusing to take their lamb or lambs. Some ewes are born that way, they do it year after year until one grows tired of them and they join the autumn draft. Apart from such rank bad mothers, the ewes likely to refuse their lambs are maiden ewes, ewes short of milk and those mishandled during lambing. A maiden ewe does not know what a lamb is. She is often frightened by it, and the least disturbance may drive her away from it altogether. She may, without resistance, allow a lamb-thieving ewe to rob her. When ewes are short of milk they are not so anxious for their lambs, and I have already explained how a ewe lambed by hand and allowed to rise too quickly may leave her lamb.

In all such instances the ewes are easily cured, very much more easily cured than ewes that later spurn a lamb they have accepted. The secret is to get the ewe and her deserted lamb away by themselves in some quiet shed. An old

ewe should be tied up with a rope halter until the lamb has sucked her and is strong, for otherwise she may maltreat it. Maiden ewes, in my experience, are best left untied. Some of the best results I have had with maiden ewes followed putting lamb and ewe together in a horse loose-box for a couple of hours. Left quiet and alone a maiden ewe will usually come to peace by negotiation with her lamb. On the other hand, a barking dog is a splendid cure for a stubborn old ewe. Its presence rouses the mother in her, and in facing the dog she instinctively moves to the protection of her lamb. When the dog is called off the ewe will usually turn and in calm contentment allow her lamb to suck.

An orphan lamb should be found a mother as quickly as possible. I emphasize the necessity for speed. The lamb that does not receive the first milk—called colostrum or beastings—of a newly-lambed ewe is seriously handicapped in life. Colostrum is not ordinary milk, it is special milk specially suited to a lamb during its first days of life. It contains, among other things, those properties which the ewe's blood has acquired in resisting infectious disease and which in turn makes the lamb resistant to infection. Cow's milk is a good substitute for ewe's milk, but no milk is a satisfactory substitute for colostrum. Therefore the sooner the orphan lamb is put on to a ewe the better it will thrive. I don't believe in waiting for another lamb to die. It is, in my opinion, far better sheep-practice to get an orphan lamb twinned on to a ewe with a single lamb and ample milk. My first choice of foster-mother is a ewe with single lamb, my second a ewe that has lost one of twins at

birth, my third a ewe that has lost her lamb by sickness. Of course, there is a qualification to that statement. I am, at the moment, speaking of the lamb's good, but no shepherd would allow a good ewe to go throughout a summer without rearing one lamb.

I always like to have the spare lambs in a crate in a corner of the lambing-field during daylight. When I suspect a ewe, because of a prolonged labour or the size of the lamb's presenting parts, of being about to bear a single, I bring a spare lamb from the crate and rub it thoroughly in the ewe's waters. I give her the adopted lamb to clean and mother first, and only when she has done this thoroughly do I give her her own. Again, if a twin is born dead, and if one of twins is lifeless it is usually the first, I rub a spare lamb in the ewe's waters, and in the same way present it to her first. By this method it is possible to find good mothers for many spare lambs during a busy day's lambing. By spare lambs I do not necessarily imply orphaned lambs, for there are many twins or triplets which benefit from a change of mother—twin lambs from ewes with one blind teat—lambs from weakly or badly milking ewes—lambs from maiden ewes. I do not believe in allowing maiden ewes to rear twins while old ewes are suckling singles, or that any ewe should bring up triplets. I once visited a farm in August and was proudly shown four ewes with three lambs apiece. I asked my friend whether he had any single lambs that year. He had, plenty of them, so I reserved my admiration. By an energetic shuffling of lambs during actual lambing I have found it possible to improve considerably on Nature's distribution of fertility. To ensure that every lamb is well

mothered and well supplied with milk is the secret of good shepherding. I am sure that science will never find a substitute for good mothers and good milk.

To put a live lamb in a dead lamb's skin is against all rules of hygiene, but sometimes it must be done. When a good ewe loses her single lamb even a few hours after birth there is no other remedy. It is not likely that a ewe is ever really deceived by this device. She never really believes the stranger lamb to be her own, but the conflict between reason and instinct based on sense of smell is one in which instinct wins. I always draw milk off a ewe before putting a strange lamb to her, for otherwise the lamb may gorge itself to its danger from her distended udder. I always tie up the ewe until she has accepted the lamb and it is sucking without resistance. That is important, because if a ewe is allowed to oppose the deception at its beginning she will never make a good mother to the lamb put on.

Where a ewe has been lost through inflammation, I prefer to rear her lambs by hand until they can be put on to a ewe that has been lambed at least four days before. I should never risk putting such lambs on a newly-lambed ewe.

There is one birth injury of lambs that should be dealt with immediately it is noticed, a rupture of the bowel through the opening in the cord. It is an injury that is most commonly encountered in big single lambs, and if not dealt with it gets progressively worse; but it can be cured. With a sharp knife I make a cut about two inches long in the mid-line of the lamb's belly and with the cord exactly midway in the cut. The knife must go right through the

belly wall. Then I get an assistant to hold the lamb on its back, push back the protruding bowel through the cut, and sew up with needle and thick thread. It is a very simple operation and seems scarcely worth describing, but I have seen shepherds attempt to force back the bowel without making the cut and that, in my experience, cannot be safely done.

Sometimes a young male lamb fails to pass water and very quickly falls sick. In cold weather and when a sick lamb is a male it is always worth while thinking of this cause. I have found the condition rather easily cured by dipping the hind quarters of the lamb in a bath of very hot water, followed by a drink of hot water containing a teaspoonful of whisky and a few drops of sweet spirits of nitre.

When young lambs are run together in a field it is essential to ensure that they do not get mixed. Ewes can be trusted to look after single lambs, but when they have twins there is danger of confusion. To avoid trouble it is well to put a distinctive paint mark on each pair of twins, and keel sticks are very useful for this purpose. Thus one pair of twins may be marked with a red spot on the head, another pair with a red spot on the rump, and so on. Such a simple system of marking saves much time in mothering twin lambs.

I like to go through the young twin lambs at dusk, making sure that each ewe has her two lambs safely by her side. Otherwise morning may reveal dead lambs, hungry lambs, or lambs rejected by their dams. I take a bottle of warm cow's milk with me on this evening round and give a drink

to any empty-looking lamb. There is seldom time to get them suckled by the ewe and yet I believe in every lamb having its stomach full when night falls. That is one legitimate use of cows' milk during lambing. There are others, of course, as in tiding over orphaned lambs until a mother can be found for them, but on the whole I think that in most lambings there is too much cows' milk used. There is always some cause for a lamb being empty. The ewe is short of milk, or she is not taking her lamb properly, or the lamb is sick.

If sheep are closely shepherded it is not difficult to distinguish a sick lamb from one that is hungry, for while a sick lamb lies by the hedge and stands with drooping head, a hungry lamb is always trotting after the ewe, its head thrust forward as though seeking a teat, and bleating. If it has been neglected, however, and has lost its strength, a hungry lamb looks very like one sick. Now if a ewe is short of milk, both lambs look hollow-flanked and empty. If only one of twins looks empty while the other is full, the cause is blind teat, hacked teat, or the ewe's dislike. In all these cases it is essential to find out what is wrong and correct it. If it is advisable to give extra milk to a lamb it is best to take the first opportunity of getting it on to another ewe. That takes time and trouble, but it is much better for the lamb. A lazy shepherd employs the milk-bottle too much. He uses it whenever a lamb appears hungry without discovering why it is hungry and without attempting to find it a satisfactory mother. Such a man wastes both milk and lambs. I remember a shepherd who bottle-fed a lamb for two days without discovering the ewe was blind in a teat.

Most hand-fed lambs become pot-bellied. That is because they are fed too seldom during the day and when they are fed they are given too much to drink. I believe in giving a little at a time and as often as possible, and the bottle must be withdrawn when the lamb's belly is level with its flanks. Otherwise it will go on drinking until blown out like a balloon. Neither should the teat flow too freely. I believe in breaking in new teats on stronger lambs and using them when soft and pliable for weaker lambs. A weak lamb should never be given a teat to suck until it is proved satisfactory on older lambs, for a weak lamb once disappointed may be very slow to suck again.

There is an art in moving young lambs from place to place. Where a lamb is in urgent need of shelter it should be carried in the way I have already described, and the ewe moved later, but it is safe to carry older lambs by the forelegs, when the ewe will follow. Sometimes a shy ewe will not follow her lambs, and in such cases I have found a turnip basket at the end of a rope a useful method of young lamb transport. Here is a labour-saving device that hails from America. A wire-wheeled hand-cart with wire netting erected round its sides is filled with young lambs, wheeled along, and the ewes follow.

When do young lambs need shelter most? In my opinion during lashing rain with a cold wind behind it. Lambs do not suffer from cold provided they are dry; they are happy in snow if it is not so deep as to smother them; but cold and wet together may kill them. Snow can be a deadly enemy on the hill, but in lowland farming I fear cold rain more.

Young lambs are always a worry. In their helpless stupidity they may be the most exasperating creatures on earth to a tired man. Yet every lamb saved means a pound or two within a few months. Also, it is more pleasant to save lives than to dig holes.

Chapter Eight

Rearing Lambs

In lamb-rearing extremes pay. I believe in getting lambs away fat at the earliest possible date, and certainly not later than the first week in July, or in keeping them to grow heavy on summer's abundance until the autumn sales are due. The method to be adopted depends upon the system of sheep-rearing and on the land's fertility, and both systems may prove successful. I am against the policy of faint-hearted indecision, altering a season's policy with each change in the weather or fluctuation in sheep prices. I do not think that a lamb is worth forcing unless there is a reasonable chance that it will be sold before July, nor do I think that a lamb unsold by that time should be disposed of before the autumn sales.

The price of lamb usually falls after Easter and again after Whitsun. It continues to fall until the autumn glut of grass-fed lambs may lower it to that of frozen imported—so that if lambs were always the same weight it would always pay to sell early. As the price per pound is falling, however, the number of pounds to sell increases, so that one may sell

a small number of pounds at a high price or a larger number at a price somewhat lower. So far as the value of a lamb is concerned it may come to much the same thing. By mid-summer, however, the price per pound has already fallen, yet lambs are still gaining weight on summer fodder. With grass-fed sheep, at least, I am loth to sell between June and September. If a wait-and-see policy is adopted it often happens that despite a certain expenditure on feeding stuffs and labour, lambs are not butcher-fat until prices have fallen. In other words, costs are unnecessarily high and returns disappointingly low.

I repeat, therefore, that my opinion is that in lamb-rearing extremes pay. One should either get the lamb fat and get it away, by giving it and its dam what they will eat, or allow the lamb to grow naturally, taking its own time, and cut out expenses on concentrates and special crops. An intermediate course is apt to result in an over-weight lamb sold too late in the season, and at a price per lb. that does not pay the expenses of even moderately intensive production.

First, then, let us consider the rearing of fat lambs and then the bringing out of those for stores.

If one wants lambing to begin before Christmas, Dorset Horn blood must be introduced, but if lambing is not to begin before late January or early February, almost any breed of lowland sheep can be used. If a lamb is reared intensively it should be ready for the butcher between three and four months after birth. I have known lambs be ready in a much shorter time. A single lamb of 80 lb. live weight should kill out at about 40 lb. dead, just about the ideal weight for modern requirements. Under the best con-

ditions a single lamb weighs about 12 lb. at birth and gains at the rate of about 1 lb. per day and should therefore reach 80 lb. live weight in 68 days' time. Twin lambs are usually lighter at birth and never grow so rapidly. Yet a twin lamb of 9 lb. at birth and gaining 0·7 lb. daily will reach 84 lb. in 107 days. A twin lamb seldom kills as well as a single, so that it is well to bring it to 84 lb. live weight, if 40 lb. dead weight is to be obtained. Naturally, all lambs do not do as well as that, but I reckon that all lambs, excluding piners, should be butcher-fat in from three to four months after birth. That is to say, I expect to sell January lambs in April, February lambs in May, March lambs in June.

That rate of production cannot be obtained with lean ewes. There are three things that make lambs grow: (1) abundant ewe's milk; (2) fresh, young and growing green crop; and (3)—a long way after these—wisely chosen concentrates.

During its first month of life a lamb's growth is determined by the amount of milk it receives. Thus, during the first month, the growth of single lambs is on the average almost exactly double that of twin lambs in the same flock. This has nothing to do with the fact of their being born twin or single, for a twin lamb reared as a single will grow like a single, and a single lamb reared as a twin will grow like a twin. If lambs are weighed when one month old, a good idea of the milking capacity of their dams can be obtained, and this, as far as I know, is the only means of milk-recording open to the sheep-breeder. The reason that single lambs are bigger and fatten more quickly than twins is simply because they receive more milk, particularly in their early days.

The amount of milk a ewe gives depends upon the way she is made and the way she is fed. There are ewes—we all know them by experience—that will never milk well, no matter how good their ration may be: extra feed goes on to their backs and not into their udders. Such ewes are often useful at summer shows (I once retained one especially for that purpose), but not for the work-a-day job of rearing strong lambs.

There is the other type of ewe, the type that is wanted and worth money, that will go down to skin and bone on poor food and yet keep up a milk supply. Such ewes are often, but not always, of what is called the milky-looking type, narrow at the shoulder and broad over the hips. I know strains of North-country Cheviots that are built that way, and their milkiness explains their unrivalled value in the breeding of Scottish half-bred lambs; but, in general, a ewe will not milk to her full capacity unless she is steamed up before lambing and is well fed after she has lambed.

If green food is to be of any use at all for lambs, it must be actively growing and at an early stage of growth. Granted this, I am convinced that the nature of the crop—whether grass or other forage—is of secondary importance. There are two types of crop on which lambs, in my experience, will not thrive. One type is where the crop has been left too long uneaten and has grown fibrous, the other where the crop is watery and lush. Either type will cause bowel derangement and give poison-producing bacteria their chance.

Concentrates play two important parts in fat lamb feeding: (*a*) In the first place, I am convinced that they are

an important help in keeping lambs' bowels in order. Abundant milk and fresh green crop together are apt to make lambs scour, and scouring does not help a lamb to thrive. Box-feed is a great help in drying up the dung, and if given first thing in the morning will do much to lower the death-rate from which lambs suffer as a result of over-rapid fermentation of the green-stuff they digest. (*b*) In the second place, the capacity of a lamb's stomach and intestines is small, considering the rapid growth of which a lamb is capable. Just as a high-yielding dairy cow requires a certain proportion of concentrates in her ration if she is to give all the milk that it is in her power to give, so a lamb requires some concentrated food if it is to grow at its maximum rate. What actual composition the concentrate mixture should have I shall deal with later on. I will merely say here, because I think it is of first importance, that suitable mechanical consistence is as essential as well-balanced chemical composition.

Fat lambs should never be permitted to suffer a check, for once they lose their baby flesh they may grow to a heavy weight before they are fat. This is not always easy to avoid, since, while anyone can plan the acreage of a crop, none can do more than guess at its yield. Unfavourable weather, particularly in early spring, may shrivel grass up to the bareness of winter. If feed is more scarce than conservative expectations predicted, I believe it best to adopt one of two plans: either the older lambs should be kept going full blast and the younger ones allowed to take their time as stores, or the singles should be fattened and the twins stored. Both plans are preferable to allowing the

whole flock to lose condition. The lambs fatten badly after a check and they fatten late. They will lose the benefit of the relatively high prices of early summer and the advantage of relatively cheap production for the autumn store sales.

So much for fat lamb production. I have found it pay well, provided that most of the lambs are sold early and one has a market for them when fat.

In the rearing of store lambs the most important point is to build up a sound character for the stock. Store lambs are purchased very largely on their reputation as thrivers and good doers. Lambs may look very well and be well-grown at sale, but unless they live well and make rapid progress in their purchasers' hands they will very quickly come to sell below their apparent value. On the other hand, there are stocks where the lambs are not so good to look at, but are known to be hardy and economical feeders. Such lambs are always in demand by experienced buyers.

As a general rule the harder lambs are done before sale the quicker progress they make as feeders. A lamb small for its age is one that will show rapid response to good feeding, provided of course its small size is due to short commons and not to disease. Buyers most certainly dislike lambs that have been trough-fed. They prefer to get the kick from concentrates after the lambs are in their own hands.

The object of the man rearing lambs for the store-market must therefore be to produce one type of lamb and to go on producing it. Repeated changes in breed or type are to be avoided at all costs, for they make the development of a character stock impossible. A common mistake is to attempt to change the type of lamb to suit minor market fluctuations.

All trade goes in cycles, and a type of lamb that sells badly for a few years may sell all the better later on. To choose a good type of lamb to breed and to go on breeding it, is, I am sure, good business.

Store-lambs should be a product characteristic of the ewe-stock from which they are bred and of the land on which they graze. The lambs should be reared on ewes' milk and green food. They should not receive concentrates in any form. Ewes must be in good condition when they come to lambing, and be kept milking all through the summer. The danger is drought. Many a flock of store-lambs is ruined because the dams have gone off milking during a fortnight of bad weather; for once ewes have lost their milk they never get it back again. To keep ewes in milk both water and food are required. There is still an idea prevalent that while cattle need a visit from the water-cart during drought, sheep do not. That is quite untrue, and especially untrue of milking ewes. After all, milk is mainly water. Again, when pastures are brown and crops have failed the troughs must come out if ewes are to milk. In my opinion, bran and oats are the best emergency drought rations for sheep, and the ewes should have 1 lb. a day of oats 1 part, bran 1 part. It is never absolutely necessary to grind grain for sheep, but bran and oats mix better if the oats are bruised. Even in drought I prefer to keep store-lambs foraging. If ewes and lambs are box-fed the lambs can be kept away by having the number of boxes barely sufficient for the ewes alone. With a mob of hungry ewes competing for trough space, the lambs see little of what the troughs contain.

After repeated trials I have come to the conclusion that

Fig. 9. REARING GOOD MOTHERS (Hampshire Down ewe tegs: Messrs. Read, Charlton All Saints.)

Fig. 10. FERTILITY'S PATTERN (Southdown breeding ewes in fold: Mrs. V. G. Stride, Bognor Regis.)

it is best to wean store-lambs the day before sale. They must be carefully drawn and yet should be sold in lots of not less than fifty. Where, as in some breeds or crosses, store-lambs are separated first into wethers and ewes, and then each sex divided into tops, seconds and thirds, it is clear that a large number of lambs is required if each lot is to be evenly drawn. The rearing of store-lambs is therefore a job for the man who is sheep-farming on a large scale. One needs about three hundred and fifty lambs to draw into really even lots if the sexes are sold together, and about double that number if ewe lambs are sold separately from wethers. A man with only a few score lambs cannot show them to advantage in the store-ring; he is better advised to fatten them if possible or to sell his store-lambs privately.

Fig. 11. BLACK FROM WHITE (Twin black lambs. Both parents were white: dam a pure-bred Dartmoor, sire an Exmoor Horn. A freak of breeding which Mendelian theory explains.)

Fig. 12. IN PASTURES NEW (South Devon and cross ewes and lambs, Taunton, Somerset. The folding system has produced fine breeds of mutton sheep.)

Chapter Nine

Pastures

A sheep's natural food is grass. Lips, teeth, the four stomachs and gut are all adapted to make use of grass. Therefore I believe grass to be the best food for sheep; but all grass has not equal value. What is good grass for cattle may be bad grass for sheep. Some of the worst thriving lambs I have seen were on wonderful pastures of wild white clover and perennial rye-grass, but that is a long way off hill pastures, the sheep's real home, which I shall first discuss.

Much has been written about the improvement of hill pastures, and still these pastures continue to degenerate. We have to go a long way back in searching for the causes of that degeneration, for it is no new thing. The following passage was written sixty years ago:

"Farms will not carry so many sheep, or keep them in so high condition, as fifteen or twenty years ago. Considerable portions of the grazings are becoming foggy and rough, and of little value as sheep pasture. We could point to one or two hirsels which carried stocks of from 1,000 to 1,100

over winter some twenty years ago, and which will now winter scarcely 800. The cause of this, we believe, is the covering of the land for so long a period exclusively by sheep, without any Highland cattle being allowed upon it, as was the case before sheep-farming reached its height."[1]

Agricultural problems live long!

The hills and glens of the Scottish Highlands offer a classical example of the deterioration of sheep pasture, and as I know the ground, it is of them I shall mainly speak.

Before Prince Charlie's adventure of 1745 there was no sheep-farming as we know it to-day in the Highlands of Scotland. Thus in 1799 it was written:

"It was an idea long entertained by the inhabitants of the North, that their hills and climate were solely calculated for rearing black cattle; and they had such an inherent prejudice against sheep, and every branch of manufacture, that the few sheep kept by them were left solely to the charge of the women."[2]

In the second half of the eighteenth and the early nineteenth century, flockmasters from Lowland Scotland and North England brought their Blackfaced and Cheviot sheep to the Highland hills. Conditions were ideal for sheep. The valleys or glens had been cultivated for generations by the clansmen, and the hills summer grazed by cattle and ponies—chiefly cattle. Sheep in any numbers had never been on the hills before. The south-country flocks

[1] Jas. Macdonald, *Trans. High. and Agric. Soc. of Scotland*, Series IV. Vol. 9, 1877.

[2] *Trans. High. and Agric. Soc. of Scotland*, Series I. Vol. 1, 1799.

throve and their masters made fortunes, for cattle and men were evicted to make way for sheep.

Since that time, about 150 years ago, sheep have never been off the hills. Valleys that were once under the plough, then covered by grasses, have become invaded by bracken until they are now useless for grazing. The hills themselves are rough and overgrown because there have been no ponies or cattle to eat them down. They have been consistently under-grazed in summer and in winter eaten bare.

Again, all through the nineteenth century, a fair proportion of the sheep stock on the hills was made up of two- to five-year-old wethers, which took little out of the soil and broke down a lot of rough vegetation in a way that ewes and lambs can never do. When imported lamb came on the market, however, nobody wanted wether mutton, so that wethers are gone from our hills, and this means the further degeneration of hill pastures.

Given the money, any competent hill-farmer could improve his hill pastures out of all recognition. He would cut bracken, graze cattle, manure, seed, cultivate, drain, fence. The trouble in the first place is to find the capital to do these things and in the second to secure a return on the capital when found. Also, human lives are short and the process of land improvement, particularly of hill land, is slow. There is not that prospect of continuity in human affairs to-day which once induced men to plant trees for their grandchildren to fell. Consequently a desire has arisen to do difficult things in an easy way. Take bracken as an example. That repeated cutting will kill out bracken is perfectly

well known, but every effort has nevertheless been made to find alternative and cheaper methods. At one time hopes arose of spreading a naturally-occurring disease of bracken by artificial cultures. Again, the possibility of spraying with sodium chlorate or sulphuric acid has been tried. These methods have remained in the experimental stage for a long time. There is the question of heather burning. Everybody knows that the rotational burning of heather is good both for sheep and grouse, but still heather grows rank and woody on our hills. The reason probably is that when grouse are shot at they go where there is shelter, and long heather is a splendid hiding hole if not good food.

Things being as they are, and men forced to have more interest in their pockets than in the land, the important thing is to choose a good grazing in the first place and to make the best use of it when got. A man who rented a hill grazing without a fair knowledge of the district and the stock it carries would be either a millionaire or a fool. Fortunately in these days of public auction the prices of lambs and cast ewes on any grazing are available to any man with the patience to go through the back files of local papers. Other sources of information are difficult to tap. Real sheep-men are very cautious in discussing the merits or failings of different stocks. They are as jealous of the reputation of their own districts as of their own stocks. The existence of such diseases as scrapie is guarded like a state secret. Factors have their employers' interests to safeguard. A friendly auctioneer is often a sound although discreet source of information. Shepherds' opinions often vary with their temperament. On the whole they are not an over-optimistic

race of men. That is no wonder, for they spend their days looking for trouble and they usually find it! Therefore, if a shepherd says a grazing is sound, it usually is so.

In looking over a hill grazing, the first thing to look at is, of course, the sheep. If the sheep look a lot better than the general appearance of the hill would lead one to expect, then that is a hill to covet. If, on the other hand, the hill looks good and the sheep poor it is probably one of those dangerous hills that smile like a bride in summer and scowl like a crone in spring. Two types of hill I dislike—one covered exclusively with heather—the other all grass. A fair mixture of herbage, enough sweet grass to make milk in summer and enough rough heather to break snow in winter, is what I like best. I prefer rolling type of sheep country to precipices and ravines, and wide and shallow water-courses to those that are narrow, swift and deep. I like to see some flat marshy ground in the cup of the hills.

Wool hanging on gorse and heather suggests that sheep have come through the winter badly, for a sheep starved during winter will loose its fleece in spring. Rabbits in any numbers are a profound disadvantage on hill grazings. Yet, in judging hill-grazings, what the ear hears is of even greater importance than what the eye sees. Reliable local knowledge is all-important. For example, I know of hill districts where the grazings are healthier at the tops of the valleys and at the sources of the streams; in other districts precisely the reverse is true. There are hills where sheep will thrive for nine months out of twelve, and yet will sicken and die unless changed to other pasture for a part of each year.

In the management of a hill grazing, local knowledge is

again of the first importance. Flockmaster, shepherd, sheep, should know the hill like the back of one's hand. A man renting a new grazing should remember that. Not knowing the hill himself, he should endeavour to engage the hill's shepherd for at least one year. It is worth paying a high wage to keep him for that time. The shepherd, if he knows his job, and fortunately most shepherds do, will be of more value than all the text-books on geology and botany that ever were written. He will know on what parts of the hill early spring keep grows; he will know the ridges that are bad for 'trembling' and for 'pine'; he will know the valleys where 'braxy' kills; he knows the dangerous bends of burns and the way snow drifts in different winds. Such knowledge can be very dearly bought.

Strange sheep on a strange hill behave like any ill-disciplined mob. They stray, wander, and get into all sorts of trouble. Sheep bred on the ground behave like a well-organized factory. They stick to their own bits of the hill, seldom straying from their own heft. They know the good bits of grazing for themselves, and where streams are safely crossed. The value of this local knowledge in sheep is so great that experienced flockmasters will often pay a price for a settled hill-stock double what they would have to spend on similar sheep in the open market.

There are three partners in the success of any hill-grazing —the sheep, the shepherd, the flockmaster—and the longer the partnership is kept undisturbed the better for all concerned. The inexperienced man who takes a grazing, is dissatisfied with the sheep and with the shepherd, wanting to change everything at once, is going to lose money. Apart

from minor alterations in management, such as a change of dip or the use of a new drug, I believe it a wise rule to leave things well alone until one can close one's eyes and see a picture of every acre of the hill and of every ewe in the flock. That will take not less time than three full seasons.

Lowland sheep pastures have less romance but give more scope for energetic management. In hill farming the sheep must be fitted to the land, but in lowland farming the land, within certain limits, can be fitted for the sheep. There is more opportunity and more chance for mistakes. First for the mistakes.

I have known many farms where land once under crop was laid down to grass and sheep brought in. Under such circumstances, as I have already said, sheep often do extraordinarily well for a time under rank bad management. I have known a flock of ewes and lambs put into a field of grass at the beginning of summer, left there without skilled attention until autumn, and make high prices at the regular sales. That does not go on for ever. I have seen the annual lamb-crop reared in that way lose 20 lb. a head in weight and 10s. a head in value within five years' time. The reasons for the degeneration are fouled ground and older grass. It is the grass I shall deal with here.

For sheep I believe a poor temporary lea superior to the best permanent pasture. Young grass for ewes and lambs is of inestimable value and it loses value the older it gets. The length of time a lea can be left unploughed without sheep suffering varies with management and land. Grass that is eaten bare in winter and seeds itself in summer will not last long. Grass on poor soil and at higher elevation

will go off more quickly than on rich lowlands. Indeed, pasture on really fertile soil, lightly stocked in winter, heavily grazed in summer, may carry many of the virtues of youth into the old age of permanency, but such pasture is seldom sheep ground. On most arable farms where sheep are kept, the more first-, second- and third-year's lea, the better for the sheep.

Ewes and lambs will never thrive on stemmy pastures. That is equally true of all crops grown for sheep; the youth of the crop is more important than its botanical composition. I have repeatedly noticed how lambs go off when grass shoots and clover flowers. So I think the reaper, set high, can make a great difference to sheep pastures. I do not for a moment suggest close mowing, which will waste food and is dangerous in drought, but merely a topping with a really sharp-edged blade. Cattle are even better than a reaper, but until there is a bigger margin between store and fat prices, grazing cattle may swallow the profits of breeding sheep.

I imagine that most seed mixtures were originally designed for cattle and hay. The grass-experts' ideal of uniform sward of perennial rye-grass and wild white clover may easily be too good for sheep. I have repeatedly been disappointed by the progress of ewes and lambs on such keep. They scour, become wormy and fail to thrive. Clover, with lambs below six months of age, can easily be overdone. That is particularly true of wild white. Weaned lambs seven months of age and red clover do well together. Ewes and lambs do very well on well-mixed herbage with grass predominant over clover. The old-fashioned seeds mixtures with their dozen to a score of different constituents may have been unneces-

sarily complex from the point of view of a heavy yield, but I am sure sheep did well on them.

A sheep pasture is all the better if it contains a fair proportion of weeds. Lambs especially will graze over a fallow field with ravenous delight. They will break through the hedge of a first-class pasture to get at weeds on the other side. Herbs like rib-grass, daisy, hawk weed, bedstraw, eye-bright, are eaten eagerly. I find that in my enthusiasm for weeds in sheep pastures I am at one with Sir George Stapledon, who writes:

"Thus, the technique of grassland improvement consists first of establishing wild white clover, and then the better grasses, and always so arranging matters that edible herbs are within reach of the grazing animal."[1]

That I believe to be sound advice, clover and grass for production, and weeds for health's sake.

Regular change of pasture is good for sheep. It is not merely a question of clean ground, for even on land so heavily sheeped that it can never be really clean, the practice is good. I think the reason is that sheep lick the jam off before they eat their bread. Whenever the flock goes into a field that has been clear of sheep for a week or so, it gets down to grazing with renewed relish. I think the sheep are busy eating the fresh leaves, the juicy parts of plants—licking off the jam. Certainly a hundred sheep will do much better if given alternate access to two fields than if the flock is divided into two smaller flocks of fifty, each confined to a single field. Whatever the value of a change may be, the change is certainly good.

[1] Stapledon, *The Land*, 1935.

Sheep by themselves can never be trusted to keep a pasture eaten down unless it is natural sheep's pasture of the *Agrostis-fescue* type, carpeting the fertile parts of hills. Cultivated pasture always grows away from them because they will not eat the stems, and heavy stocking in itself is no remedy. That is where cattle come in. I have always thought it a wise plan to graze with sheep and follow with cattle, although the opposite method is usually advised. Sheep are by far the more discriminate eaters and should therefore, I maintain, have first choice: but then I like sheep so much better than cattle!

Chapter Ten

Sheep-Feeding

If this chapter is a little more technical in its beginning than some others I hope my readers will excuse me. Terms like calories, protein, minerals and vitamins may not be of much importance to the practical farmer. Yet the half-truths of science roll so smoothly from glib tongues. Protein, mineral, vitamins are things which one can't see but for which one may be persuaded to pay. There is a big business in oil cakes, mineral supplements and things of that nature. They may be of greatest value, they may be useless, they may do positive harm. It all depends upon how, when and where they are used. It is therefore wise either to use only the natural foods that an adequately-manured farm affords, or to attempt to understand the elements of supplementary feeding of stock. Ignorance and an open cheque book do the farmer no good.

The natural and best foods for sheep are milk and grass. For the first month of its life a lamb is almost entirely dependent on milk, and it never grows so fast again. That shows how good a food milk is. Of what is it

composed? The average composition of ewes' milk is as follows:—

	Per cent
Water	80·8
Fat	6·9
Sugar	4·9
Protein	6·5
Minerals	0·9
Vitamins	Trace

About 80 per cent. of ewes' milk is water, which usually costs nothing, and yet ewes will not milk without it. I remember very clearly an occasion where a flock of ewes would not settle and whose lambs were doing badly. Matters were put right by taking down a fence to allow access to a running stream. How those ewes drank! There still exists a superstition that sheep need little or no water. Dry sheep on fresh pasture and where dews are heavy can get on without it, but milking ewes under all circumstances, and all sheep during drought, need water before them like any other animal.

Fat is the most variable constituent of milk. It, and also the sugar of milk, are used for energy purposes. A lamb is always using energy. Even when it is asleep, its heart is beating, its lungs expanding, digestion working, its body-heat being maintained. The energy used for these purposes comes from the food it eats, and the amount of food needed to keep life going without gain or loss of body weight is called the *maintenance requirement*. A calorie is a measure of energy. It is the amount of heat needed to raise the temperature of one unit of water by one degree centigrade.

There are about twenty calories to each ounce of milk, and this means that when an ounce of milk is completely burnt, its combustion produces enough heat to raise twenty units of water by one degree of temperature. The heat of a lamb's body, its movements, the very life in it require energy, and the main sources of that energy are the fat and sugar of the ewe's milk. Fat provides more energy than an equal weight of sugar, about twice as much, but a certain amount of sugar must be along with fat, before fat can be completely used.

A lamb gets more fat and sugar in the ewe's milk than is required for its maintenance. The excess, called the *production requirement*, is used for growth: not that the actual process of growing requires much energy, but the excess of both sugar and fat is stored as fat, and the lamb puts on a corresponding amount of weight.

Protein also can be used to produce energy, and part of it is always used in that way, but the main use of protein, for which fat and sugar are no substitutes, is the building of muscle—lean flesh. Red meat or muscle is mainly water and stored protein.

The mineral content of milk is remarkably constant. Three-quarters of a part to every hundred parts of milk does not seem a great deal, but that 100 parts includes the water. Mineral matter forms about 6 per cent of the solids in milk. What are the minerals in milk? They are lime, phosphates, potash, salt, magnesium, sulphur and iron. These minerals are present in every organ and part of the lamb's body, but certain minerals are concentrated in certain places, lime and phosphate in the bones, sulphur

in the wool, iron in the blood. There are traces, mere traces, of other things in milk. Iodine, for example, which is concentrated in the lamb's thyroid, copper and the vitamins. Although things like iodine and copper and vitamins are present in traces only, they are nevertheless of first importance.

A lamb takes an occasional nibble at grass before it is a week old, but it does not begin to graze much before a month. Of what is grass composed? The answer depends very much upon the age of the grass. In immature mixed grass there is:—[1]

	Per cent
Water	70·3
Fat	1·5
Sugars, etc.	13·8
Fibre	6·3
Protein	5·1
Minerals	3·0

The younger and more quickly growing the grass is, the more water, protein and minerals it contains. The dry matter of short young grass has as high a percentage of protein as linseed cake. The older grass grows the less water and protein and the more fibre it contains. Fibre is hard, starchy stuff, largely indigestible, especially for lambs.

Milk and grass are the natural foods for lambs and they do very well on it provided the grass is neither too rich nor too watery, when they scour. On very fertile pastures, or on such as are highly manured, this may very easily happen. Milk and luscious grass together provide too much water and too much protein. The lambs do not thrive as

[1] *Feeds and Feeding*, Henry and Morrison, 19th Ed., 1928.

they should in the midst of apparent plenty. That is where a carbonaceous concentrate feed is very useful. It cuts down the quantity of wet, easily-fermentable food that the lambs are eating, and provides something dry and more solid in its place. The concentrate used should be high in starch, and maize or barley should form its bulk. I know nothing better than ewes' milk, young grass and maize for fattening young lambs. Maize must, of course, be mixed with other grains when fed to lambs, for in itself it is too heavy. A mixture of:—

Maize	2 parts
Oats	1 part
Wheat bran	1 part

is more satisfactory in its results than maize alone. Young lambs when being suckled by the ewes require no protein concentrates nor mineral mixtures. If ewes go off milking and pastures dry up, as may easily happen in a June drought, lambs must have a protein concentrate such as linseed or they will not grow: but under normal weather conditions maize lightened by oats and bran is what is required.

I have never considered it advisable to feed concentrates to lambs intended for the store market. On pastures suitable for raising stores, concentrates are not needed to correct over-richness in the grass. I have, however, often seen lambs kept for stores on pasture where it would have paid to fatten and where concentrate feeding would have done the lambs much good.

No more than ¼ lb. of concentrates should be fed to a lamb at any one time. This amount can be fed twice daily

if the lambs are being pushed, but in lambs of the medium-sized breeds I do not think more than ½ lb. of concentrates daily is ever required, nor is more than that amount advisable.

To induce lambs to eat concentrates at a very early age the most palatable mixture should be used at the outset. The concentrated foods of which I have found lambs most fond are locust beans, peas, oats and bran, and a combination of these should be used as a starting mixture, gradually changing to the maize, oats, bran mixture already described.

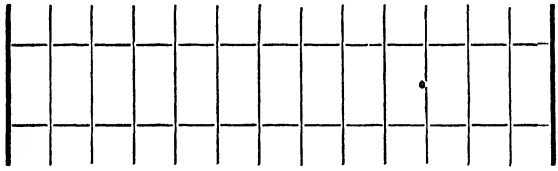
Feeding concentrates to lambs successfully demands some simple but necessary equipment. The concentrates fed must be absolutely dry and fresh. When I first fed lambs I had to carry a bag of grain all round the farm. If it was a wet morning, the last lot fed got cold porridge. Moreover, it was difficult to regulate the amount fed, so that some lots got too much and others too little. It is much better to have a locked metal bin beside each array of feeding troughs, containing a pail of known capacity. Then the lambs are fed dry food rationed with reasonable accuracy.

Troughs can never be clean and dry unless they are turned over after each feed. Waiting for the lambs to clean out the troughs may waste much time on a busy morning, so that I like the double V-shaped trough, shaped like this :—

which always has one side dry. When A is in use, B is draining and vice versa.

Lambs, of course, must be fed separately from the ewes.

There are all sorts of elaborate lamb creeps on the market, but one can make quite a satisfactory home-made job with smoothly-rounded fencing posts and rope. The arrangement is like this:—



There are two ropes, a lower just above the level of the lambs' backs, and an upper just below the tops of the posts. The lambs get through and the ewes are left behind. Working on the principle that lambs creep out of a pen more readily than they will creep in, a shepherd I knew adopted the plan of penning ewes and lambs together in the creep and arranging the troughs outside of it. The lambs certainly came to their feed more quickly than when the troughs were placed inside the pen.

Weaning is a critical period for lambs. Where lambs are sold as stores I think it better to wean them on the day of sale. Otherwise they are apt to lose bloom and condition when most wanted. Even under the most favourable circumstances lambs are apt to go back for a couple of weeks after they are weaned. Where store lambs are weaned before sale, or where they are to be winter-fed at home, they must have fresh, clean pasture on which to run. Kept on permanent pasture, particularly if that pasture be stemmy and dry, they will suffer from those commonly associated evils—malnutrition and worms. Lambs should never be fed on

starchy concentrates in autumn or late summer. For weaned lambs a mixture such as:—

Linseed	1 part
Oats	1 part
Bran	1 part

is best. The surplus protein of early summer grass is gone by August or even by July.

Winter feeding of tegs is not the industry it was some thirty years ago when but few lambs were slaughtered during summer. I think the development is sound, for winter crops fed to a flock of ewes are better repaid than when fed to feeding sheep. Nevertheless, teg fattening might become more important again at any time when quantity rather than quality of mutton was of first importance. The basis of feeding is roots, forage and concentrates. Having been on autumn crops—clover aftermath, etc.—the tegs are gradually accustomed to roots, turnips (white or yellow), then swedes. Turnips may be fed whole up to Christmas, but after that they must be cut, since young sheep lose their lamb teeth then. Turnips are sliced by a turnip-cutter driven by a portable petrol engine. Tegs will eat up to 16 lb. of turnips a day, but I think it is better to give them no more than 12 lb. and allow them rather more hay. The quality of the hay is of first importance. About ¾ lb. per head daily should be allowed and it must contain a fair proportion of clover. Sheep will not thrive on roots and timothy hay. Not only should hay fed to sheep be clovery, but it should have been cut at a fairly young stage of growth, full of leaf and well cured. Sheep like nothing better than

the right kind of hay, but if it be stemmy and musty they will waste a lot. With well-cured, clovery hay, feeding sheep require no minerals or vitamins—they get all they require in the hay. Where the right kind of hay is limited in amount it may be spun out with bright oat straw. Hay and straw should not be mixed, but fed on alternate days, hay one day, straw the next. Good straw is much better for sheep than bad hay.

Concentrates fed with roots must be albuminous. Now, since the tendency of sheep on roots is to scour, it does not do to feed concentrates of a laxative nature. A good mixture for the purpose is one of

Cottonseed cake	1 part
Oats	1 part
Dried grains..	1 part

fed at the rate of ½ lb. per day.

The routine of teg feeding is—concentrates at daybreak, roots morning and afternoon, hay racks filled at night. One man can tend a flock of four hundred when roots are uncut, half that number when roots are cut. On this system tegs should gain up to 0·4 lb. per day.

In feeding any class of sheep there are several general rules that mean the difference between success and failure. The first is punctuality. Feeding times must be strictly adhered to. Sheep become quickly accustomed to their meal-times. If fed before then they are not ready; if after, their hunger will have passed. The second point is cleanliness, both of the food itself and of the utensils in which food is fed. The third is never to feed more at one meal-time

than the sheep can clean up before the next. The fourth is to avoid sudden change of food—and this needs foresight. Sheep should be getting gradually accustomed to a new crop before the old is done. Sudden changes in feed cause more losses among sheep than most diseases. Sheep should never be allowed empty-bellied on to new food—the edge must be off their hunger. The fifth is that succulence is dangerous to sheep both at sunrise and at sunset. Frosted succulence is a common cause of death. The sixth rule is to feed with a close watch on the progress of the sheep. The ultimate test of a ration is the way the sheep are thriving and not what the text-books say!

Chapter Eleven

Summer Tasks

Dipping is a legal nuisance or veterinary benefit (depending on the way we look at the matter) that is primarily directed to the control of sheep-scab. Scab, unfortunately, is still with us, although other countries, Australia and New Zealand, for example, have got completely rid of it. That is because, perhaps being less interested in wool, we have not tackled the question so thoroughly. In New Zealand they rounded up all the sheep they could get at in order to dip them, and then actually *shot* those they couldn't get at. Some flockmasters in this country appear to have more respect for a scabby sheep!

Our law enacts that dipping must take place, once between January 1st and August 31st, and again between September 1st and November 12th, and a policeman must be present to see the job properly performed and every sheep completely immersed. I always feel that the presence of the Force adds tone to a dipping, and one, but only one, officer I knew took off his jacket and got down to the job with the rest of us. Actually, dipping according to legal

requirements will not control scab, hence the double-dipping orders in areas where an outbreak is reported, for the police must be notified where scab breaks out. To cure scab, double dipping with an interval of 15 to 21 days between dippings is required. The first dipping kills the adult scab-mites but does not kill their eggs. The 15- to 21-day interval allows time for all eggs to hatch but is not sufficiently long for more eggs to be laid. The second dipping therefore dispatches the last of the Mohicans. Dipping also kills keds or kaids, lice, ticks and any maggots that may be on the sheep. Manufacturers also claim that dip stimulates the growth of wool. I am very doubtful of any direct action on the fleece, but certainly any measure that makes sheep more comfortable and more healthy will result in a greater wool-growth.

There are many dips on the market. I am naturally unable to name the brands that I consider most reliable, although I have my preferences. One thing I am sure of, and that is that some dips are much better than others. I once cleaned up a particularly verminous hill stock by the simple method of changing dips. A second point I am convinced of is the advisability of sticking closely to the manufacturers' instructions. The directions given, at least by reputable firms, are the result of careful experimentation under practical conditions. It is no easy matter to compound a dip that will kill sheep vermin without harm to the sheep. I once assisted at a dipping where the farmer tested an article of his own concoction. A sheep lost its wool, the farmer his temper, and the shepherd got gassed.

There are all kinds of patent dippers on the market.

A hundred and one labour-saving devices have been suggested or patented, yet dipping remains a laborious job. My experience is that any dipper is easy to work with sheep unaccustomed to its special devices, but that no dipper, no matter how ingenious its construction, is proof against the stubbornness of an old ewe facing the music for the third or fourth time. Because you cannot fool all the sheep all the time, I think, quite frankly, that elaborate dipping arrangements are a waste of money. There is always some place where the sheep jib.

The actual process of dipping is almost always performed in too great a hurry. A shepherd's object invariably seems to be to get as many sheep through in the shortest possible time. I have seen many sheep come into the dripping pens without a drop of the dip having penetrated to their skins, a waste of money and of time. The catcher is more often at fault in this than the man dipping. Personally I insist that every sheep be immersed in the water on its back, held there a few seconds, turned, head dipped under and then set free. A fairly long swim out is an advantage. Most dippers are too short. It is well to inspect the first few sheep emerging to make sure that the job is thoroughly done and the fleece well soaked. When dipping is over the sheep should on no account be put under cover. The fumes, harmless in the open, may be poisonous in a shed, and it is better to lose a few gallons of dip than half the flock. Another danger arises in using arsenical dips on sheep with skins broken by maggots: I have seen heavy losses occur from that cause. Under such circumstances it is better to use non-poisonous dips and those on the weak side.

Fig. 13. THE HOUSE OF STRAW (Lambing fold, with Southdown ewes and lambs: Lady Fitzgerald's estate, nr. Faringdon, Berks.)

Fig. 14. MATERNITY ALLEY (Pens in the lambing fold: Court Farm, Imber, Wilts.)

Fig. 15. GOOD SHEPHERDING

(Stoddart, a well-known Border shepherd, with Cheviot ewe and lamb.)

Dipping may be performed without risk at any time of year provided the weather is dry and not over cold. Even ewes heavily in lamb can be safely dipped provided they are gently handled. Many flockmasters like to dip their ewes shortly before lambing in order that lambs may be more free from vermin and in consequence be less likely to nibble wool and thereby get wool ball. At one time I was prejudiced against the custom because of the presumed risk to the ewes. I must confess, however, that I have seen many flocks of heavily-in-lamb ewes dipped without accident even in districts where abortion is common.

It is a mistake to dip less than a fortnight after clipping, particularly if machine clippers have been used. A hot sun, short wool and dip may blister a sheep's skin rather badly and always give rise to irritation. The times I prefer for routine dipping are one month after clipping, when the wool is short and dip economical in use, and a fortnight before the rams go out to the ewes. In southern districts, of course, the second compulsory dipping will occur after the ewes are served. Finally, it always pays to buy dip in bulk.

Except for show sheep, it is better to clip too late than to clip too early. A cold wind may cause weed among milking ewes newly shorn. Were it not for the fact that heavily-fleeced ewes are apt to roll on their backs and die I should be inclined to clip later still. Our climate, however, in any case forbids finesse.

Sheep can be clipped either by hand shears or by machine. Both methods have advantages. In the hands of an expert Australian shearer, mechanical clipping is beautiful to watch; but it is not quite so beautiful when the demonstrator

leaves and our own shepherd takes over the job, nor is it so quick. I have noticed, however, that once a man has become even moderately proficient with the machine, he is seldom willing to return to the hand shears. In inexpert hands the breakage bill for a machine may be quite considerable, as combs and blades will not stand knocking against cobbles or a concrete floor; moreover, bad wounds on the sheep are easily made. The hand shears are slower, make a reasonably good but scarcely so neat a job, but are safer.

My opinion is that where a large number of lowland sheep must be shorn quickly, and if practised hands are available, mechanical shearing is the best. Hill shepherds like to leave a good deal of wool on the sheep as a protection against rough weather, and that is best done with hand shears.

For the small lowland flock I have never been able to see the necessity of speed. The shepherd can quite easily clip a score or so of sheep a day, getting through the work quietly without having to buy a machine or hire extra men. On the whole I do not think mechanical shearing is likely to oust the hand-shears in this country. In Australia, where shearing is a specialized trade, and flocks are numbered in thousands, the conditions are quite different and the machine essential.

The question often arises as to whether sheep should be washed before clipping. Washed wool, of course, fetches a higher price per lb. but weighs less. By the time the extra price per lb. is balanced by the fewer number of lb. to sell there is seldom much in it. Some men must find washing profitable because a large proportion of British wool is

marketed in this condition, but, personally, I doubt whether it is worth the trouble. If washing is performed, clipping must be done before there is much 'rise' of yolk in the fleece, otherwise the wool will not be classed as washed wool by the merchant.

Wool-merchants are in the habit of offering well-meant advice on the marketing of wool. They say that it is of the utmost importance in manufacture that the wool be free from tar dyes and vegetable matter. They advise clean shearing-pens, and a separation of soiled wool from the fleece. I have followed their instructions religiously, gone to the expense of special branding fluids, covered the shearing shed with clean tarpaulins and finally received a rather worse price than my neighbour who shears his sheep in the open field. At the present time I am under the impression that wool-merchants pay more or less of a flat-rate for the same class of wool, and that they make no sensible price differentiation between clean wool and dirty. If cleanliness in preparing a wool-clip were recompensed in £ s. d., I am sure that farmers would be only too willing to take all precautions to keep it clean: but I have yet to see or hear of such precautions being repaid—others, I hope, have been more fortunate.

'Castrating and tailing are jobs usually combined in the one bloody summer festival. It is an important business, of which too little is yet known. There is controversy as to the age at which the job should be done and the best way of doing it. The two questions are inter-related, since the best age for castration depends upon the method used. The simplest and probably the oldest method is to slit the

bag and draw the testicles out with the teeth. It is not a job for a man with a delicate stomach, but it gives excellent results. I prefer to see a shepherd draw the testicles with his teeth than trim them out with the knife. Both methods can be used when the lambs are quite small, about a fortnight to three weeks old. That is an advantage because the older the lamb the greater the shock produced by castration. The danger of infection through the open wound has been greatly exaggerated. I have seen thousands of lambs castrated by the teeth-drawing method and not one lost. Only once have I seen a lamb die from bleeding. There are certain farms I know of, however, where open castration is regularly followed by the death of lambs, owing either to the poor condition of the sheep or to the unusual abundance of blood-poisoning germs in the soil. In such instances the mechanical castrator is preferable. In this country castration is performed before flies are a serious pest, so that the open method is not dangerous in that respect.

The greatest advantage of open castration is its certainty. When two testicles have been thrown on the ground the lamb is surely castrated. It is practically fool-proof. If one or both testicles are undescended the lamb's tail can be left undocked, thus distinguishing it as a 'rig.' So much cannot be safely said of the mechanical, crushing castrator.

The castrator crushes the cords, thus leading to the gradual but finally the complete degeneration of the testicles. Many claims have been made for this instrument, and I shall discuss, as fairly as possible, its advantages and possible demerits. In the first place it is bloodless. That is of chief benefit on farms such as I have mentioned where infection

is rife. Ordinarily the loss of blood sustained by the open method does not appear to do much harm. After all, bleeding was considered the way to health by our not very remote ancestors. As I have also mentioned, castration, in this country, is not performed when flies are numerous. From my own observation I am very doubtful whether bloodless castration is the more humane method. It is very far from fool-proof. With care and practice it could, I believe, be made 100 per cent effective, but our shepherds, though usually careful men, have not the practice. In unskilled hands the bloodless castrator may leave far more rigs than one sees where the open method of castration is employed.

On the other hand, in my opinion the bloodless castrator has several distinct advantages. I am convinced, for example, that it results in a bolder and more masculine head on wether lambs and in a stronger horn in horned breeds. That is a distinct advantage where lambs are sold as stores. It is claimed that lambs also grow to a greater size, and some years ago I performed an experiment to test whether this were true. My conclusion was that the claim was justified, that, in fact, lambs castrated by the bloodless method put on more weight than those castrated by the open method. Since others have performed similar experiments without finding any difference between the two methods I speak with due caution. I shall merely explain how I did the experiment and give the results I obtained. The method of the experiment is quite as important as the results. In the first place I decided that to castrate half the male lambs with the knife and half with the castrator was not sufficiently exact. What really governs the growth of indi-

vidual lambs of the same flock is the amount of milk each gets from its dam. I knew that a well-milked lamb would be heavier at the end of the summer than one poorly milked, castrate them as I liked. So I tried to make the experiment more useful by using male twins as being more likely to have equal milk supplies. Of each twin I castrated one by the teeth-drawing method, the other with the bloodless castrator, putting a clear identification mark in the ear of each. All the lambs were weighed before castration and again at weaning. These were the results:—

Live weight increase of Lamb

	Castrator	*Knife*
	lb.	lb.
First pair	59	51
Second pair	57½	51
Third pair	59	49½
Fourth pair	53½	50½
Fifth pair	54½	53
Sixth pair	72	63
Seventh pair	62	60½
Eighth pair	58½	46
Ninth pair	57½	53
Tenth pair	55	53½

That was the result of my experiment. It may have been a chance result, but I do not think so.

Chapter Twelve

Buying Sheep

Let us first consider the case of a man buying sheep—going into sheep, as the saying goes—for the first time. The best times to do so are when a country leaves the gold standard or when war is imminent, for then the sheep can be sold again later for nearly double the price. I emphasize the effect of such disasters on the value of sheep, since I have seen too many good men ruined because of ignorance of them. I knew several men who sunk their capital in sheep in the years between 1918–21. Sheep were paying handsomely, the price of sheep was high, sheep stocks were depleted, and all seemed well. It was unfortunate for these men that they did not know that the end of a war is the worst possible time to begin sheep-farming.

In buying hill sheep one is usually faced with the prospect of paying not only for the sheep but for their knowledge of the hill, their character as a hill-stock, and a certain immunity against local diseases. We may call these various factors acclimatization, and the price paid for them, acclimatization value. Acclimatization value is a very real thing,

for to accustom sheep to strange hill ground costs a great deal of money and trouble. Sheep stray, do not 'heft' properly, take time to learn the best places to graze in, and often die in large numbers from diseases to which they are unaccustomed. Of course the wilder and more unhealthy the hill, the greater is the value of acclimatization, and therein lies the difficulty. Poor sheep on a deadly hill often cost more to take over than good sheep on sound sheep country, and that seems scarcely fair. Again, in districts where acclimatization value is paid for, the sheep stock is usually bound to the ground; that is to say, a condition of the lease is such that the incoming tenant has to take over the stock at a valuation that includes acclimatization value. At the end of the lease the tenant sells the stock at valuation to the succeeding tenant, or if no fresh tenant is forthcoming, to the proprietor. The result is that in periods of depression the proprietor is often left with unprofitable stocks on his hands, and is unable to get rid of them in the open market because of the crippling loss in acclimatization value for which he has had to pay his outgoing tenant. The question has been debated before Government Commissions, but no equitable solution has been found.

Sometimes it is possible to obtain a hill-stock at 'market valuation.' This is a somewhat cheaper method of purchase, although—and this must never be forgotten—the 'market valuation' is always fixed at a much higher figure than that which the sheep would actually make in the open market.

In both these systems of valuation the custom is for the sheep to be gathered and to be valued by two valuers, one appointed by the ingoing, the other by the outgoing tenant.

In the event of disagreement the valuers appoint an oversman. That raises another difficulty for the buyer, since he does not know either the precise number of sheep he will have to take over nor the exact price he will have to pay for them before he rents the grazing. It is presumed at valuation that the stock is of regular ages, that is, that the number of old ewes is in proper proportion to those of younger ages. In practice the stock is apt to be swollen by the retention of too many old ewes. Again, the basis of valuation is usually the price made in the open market by cast ewes from the stock. Naturally the outgoing tenant ensures that his cast is very closely drawn for a few years previous to the termination of his lease. The final result of all these complications is that a man taking over hill-sheep by valuation pays too much for them and that his business is over-capitalized at the beginning. His only consolation is that he can play the same game and recover his money at the end of his lease.

A third method of taking over a hill-stock is by 'fixed price.' That is to say, the incoming tenant undertakes to buy the stock at a certain price on the understanding that he receives the same price for the same number of sheep when his lease is ended. The disadvantage of this method is that should the tenant improve the stock during his lease he receives no benefit. On the other hand, should the stock deteriorate he suffers no loss. Purchase by 'fixed price' is, therefore, by far the safest method for the beginner. His capital is absolutely safe, and he knows his capital commitments.

The remaining possibility is to rent hill land clear of

sheep and introduce a fresh stock. Provided the land has been free of sheep for several years, this pioneering method is often a success. I have known experienced sheep men do extremely well out of it, and it was the method by which fortunes were made out of hill-sheep in the past. Putting strange sheep on a strange hill is, however, a risky venture and is not one suitable for the novice.

I have already discussed hill-grazings, the types I prefer and the unequalled value of reliable local knowledge. It is a great advantage if the outgoing tenant's shepherd can be re-engaged, or if this is impossible a local shepherd to whom the district is well known should be employed. I would put the value of such a man at twenty pounds a year more than that of a shepherd unfamiliar with the stock.

Buying sheep to stock arable ground is a much easier affair. Such sheep are either purchased by private deal or in the open market, while less capital is required and none of it is sunk. If the sheep do reasonably well and the market remains reasonably steady, they can be sold again without great loss. For the beginner there is nothing safer than old ewes out of a healthy stock. They cost less money and are much easier to handle and to lamb than younger ewes. Moreover, they have more lambs and provide more milk. No class of sheep is dearer than gimmers, relative to their actual value. If one wants young sheep, it pays better to buy ewe lambs.

Bringing out gimmers is usually in the hands of specialists who buy ewe lambs, winter them, clip them, and sell them as gimmers at the autumn sales. They are clipped early so that they will have ample wool to 'shape' before they are

sold. They look very fine all dressed up and coloured for sale, but very often they have been overfed on roots and cake like any butcher's beast and are soft as butter when they come to breed. Moreover, because of the great skill in dressing them before sale, they often disappoint after purchase when art wears off and Nature stands revealed!

Ewe lambs, on the contrary, are usually sold direct off unforced summering on grass and their mother's milk, are not disguised by clever shearing and are of the best age for acclimatization to strange ground. If they are well grown they can be mated in November to produce some useful lambs in May, but must be generously wintered or they will not grow. By the time one has the wool and a few lambs off ewe lambs they are usually cheaper to buy than gimmers and they live much better.

When buying ewe lambs it is well to remember that the first draft from a breeding flock contains a disproportionate number of single lambs and a corresponding paucity of twins. Now, since twinning is due, among other things, to hereditary predisposition, buying single lambs is not the best way to ensure prolificacy in one's flock. The second draft from a breeding flock contains a goodly percentage of sturdy twins, so that for choice it is the second draft I prefer to buy. Third and later drafts are apt to contain too many gimmers' lambs and badly-milked lambs to make good breeding stock.

Rams are difficult to buy well. Some men I know feel safer buying fifty ewes than five rams. The fashionable lady most skilful in 'make-up' is an innocent child compared with the experienced shepherd of pure-bred sheep. I think

that, for commercial purposes, it is better to purchase the cheaper rams from a well-known flock than to search for individual excellence. The expert breeder of sheep can trust his judgement in picking out superlative sheep from their neighbours, but for crossing purposes sound, medium-priced representatives of known blood are safest and best. I prefer ram lambs to shearlings, especially where the same breeder exposes both lambs and shearlings for sale. Shearlings in such a case may be slowly maturing sheep that were unfit for sale as lambs, and slowly maturing strains are not wanted among lowland sheep to-day. Again, shearlings unused as lambs are apt to acquire bad sexual habits and to be unwilling workers when put to the ewes.

Anyone who has bought sheep extensively realizes the value of buying from a healthy stock. Nothing is more disheartening than to bring home unsound sheep. I remember a winter and spring made miserable by a flock of cast hill ewes that refused to live.

The main secret of buying healthy sheep is knowledge of districts and stocks. Certain districts and certain stocks have a deserved reputation for producing healthy sheep. Others have just the reverse. It is up to the buyer of sheep to know these things for himself or to secure the disinterested advice of someone who does. Since disinterested advice is sometimes difficult to secure it is better to learn quickly oneself from those who know better. I have found that sheep-men talk most freely after the sheep are all sold. Before sale they are wary of spoiling a neighbour's sale, but after the day's work is over they can sometimes be induced to "spill the beans." Particularly with auctioneers, all sheep must be called sound

until they are sold. If one is forced to buy strange sheep in a strange market, I believe brightness of eye to be the best indication of good health. Information may be gained by feeling the back and noting the condition of the wool, but for my own part I place most reliance on the gleam of the sheep's eyes.

In buying feeding lambs, the time when they are to be fat must be considered. Small lambs need long keep, and hill lambs longer than those off grass. It is important to remember that no matter how skilful feeding may be, sheep of a certain class will take a certain time to fatten. A lean hill lamb will not be fit for the butcher before spring, no matter how it is fed. Given the necessary time it will fatten on precious little. If feeding lambs are wanted to eat autumn forage and be fat by Christmas, big, forward, well-conditioned lambs are required. These, the wether tops, are sometimes dear to buy, as butchers may compete with farmers in their buying and there can be no doubt that small, cheap lambs kept until spring or early summer will often leave more profit.

I think it a mistake to take any kind of sheep from south to north, and that is especially true of feeding sheep, since they most often drift south again when killed. The margin on feeding sheep will not cover a return railway ticket.

In bidding for sheep in open market there are certain dangers. There are men who like to top the market sale price—those are the professionals. Other men seem to get some satisfaction from paying the highest price. How often are they not amateurs? The best sheep may be too dear: indeed, they usually are. A successful sheep farmer

of my acquaintance says that he has a use for only one kind of sheep—cheap ones. Many sheep are provisionally sold before being offered for sale. Mr. A sells to Mr. B at such and such a price provided they make no more in the ring. There is often a Mr. C, who knows them both, who is ready at the ringside to make 'psychological bids' against the unwary. It is therefore pure folly to go to a sheep sale, pick the sheep one wants, and buy them at any price. It is also a prime mistake to be too well dressed at a sheep sale, for it encourages Mr. C!

What I myself do at sheep sales now is to make a few bids on sheep I do not want, dropping out well below their value. For those I *do* want I bid usually no more than 2s. 6d. a head above my own valuation of them made as they enter the ring. On *no* account do I go more than 5s. a head above my valuation. I make it as little obvious as possible which sheep I really require. At one time I failed to take these precautions, but I have learnt my lesson from Mr. C.

Chapter Thirteen

Selling Sheep

Price is the main problem in modern farming. It was always so to some extent, but at times financial confusion and instability of exchange have made efforts at efficient production look merely silly. Men have farmed badly and made money. Men have farmed skilfully and been ruined. It has all depended upon what money has been doing and not what farmers have tried to do. We have all had bitter experience of this. I have sold top lambs in one year at a price barely equal to that of pining lambs in the previous year. Badly fed sheep have made a handsome profit in one year, while sheep fed to perfection have lost £1 a head the next. It all makes sheep-lore, energy, science and practice look pitifully silly when it comes to selling sheep.

Sheep-men try to predict the value of their produce by watching the condition of forage crops in their district. If grass is plentiful then sheep will be dear, or so they think. If it has been a hard spring and many lambs have died, then lambs will sell well, or so men think. Now these factors of supply and demand have an effect, but they do not provide

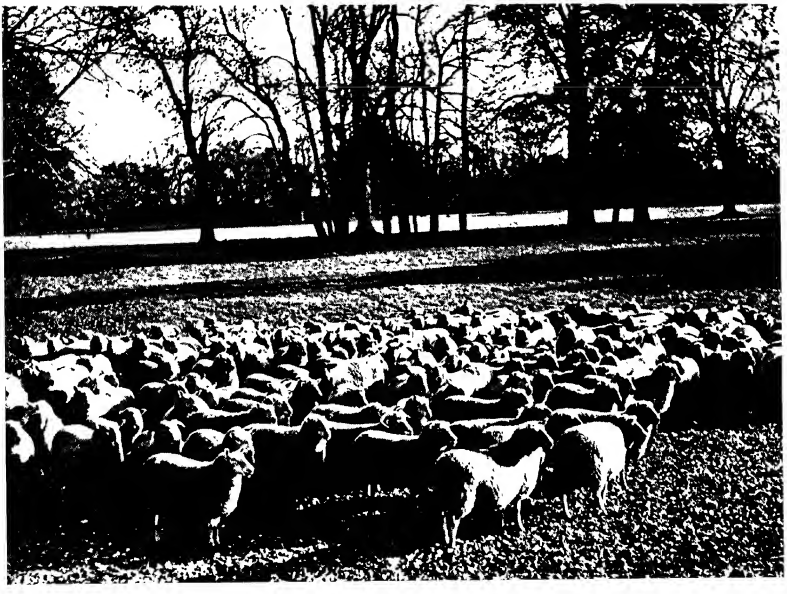
the reason why fat lambs in one year fetch £3 a head and two years later make barely £1. The real reason for these big fluctuations in the price of sheep is one of money, not of sheep. The value of money, not the value of sheep, has changed.

I am not a financier, and this is a book about sheep, not a treatise on finance, but I do want to emphasize the importance of change in the value of money because nothing, in my opinion, has had so fundamental an effect on the price of sheep. In former days money was based on the quantity of gold in the banks. When gold was plentiful prices rose, when gold grew scarcer prices fell. The moderate degree of prosperity which British farming enjoyed for a large part of the nineteenth century was due to gold being discovered in California, Australia, South Africa, Alaska. With each fresh discovery of gold, prices rose, and with rising prices sheep-farming has a chance to pay. When a man offers a rent calculated on the basis of lambs worth £1 and wool worth 6d. a lb. he can hardly fail to do well when prices rise to make lambs worth £2 and wool 1s.

When the reverse process happens the best farmer may face bankruptcy. During the war of 1914–18 this country went off the gold standard, that is to say in order to pay the colossal war expenses notes and credit were issued without any regard to the quantity of gold the country held. Then farming paid. In 1925 the gold standard was restored, the extra notes and credit were called in to their proper relation to gold. Then farming slumped. The gold standard was short-lived. There wasn't enough gold in the country, for it was all going to America to pay war debts. Notes and

Fig. 16. SPRING'S SCARCITY (Lambing time, March, in a cross-bred flock: Mr. J. A. Fox, Scunthorpe, Lincs.)

Fig. 17. SUMMER'S ABUNDANCE (Kerry Hill and cross ewes and lambs on summer pasture near Ludlow, Salop.)



credit became ever scarcer as gold departed. Crisis came. I remember good breeding ewes selling for 5s. a head. I remember an auctioneer crying in despair: "Will nobody give *anything* for these grand sheep?" Money was so scarce that a few pounds would buy any number of sheep. Then the country abandoned the gold standard, regretfully, cautiously, and sheep prices rose cautiously, regretfully, too. I often hear men say that 'a pound is always worth a pound.' It never has been, is not and probably never will be. It is unfortunate, but true, that when a shepherd drives lambs to the autumn sales the price he gets depends far more upon the credit issued by the banks than upon the substance and bloom of his lambs. If farmers understood this better there might be less firing of shells into the wrong camp.

Granted that finance governs the profitability of sheep-farming, there is still much that the individual farmer can do in selling sheep to the best advantage.

There are several methods by which sheep may be sold.

Auction markets, as things go in agriculture, are relatively recent affairs. It is generally admitted that they are better organized in Scotland than in England, and having attended them in both countries I most cordially agree. Some of the sheep sales I have seen in England were like badly-packed Rugby football scrums. In Scotland everything is orderly, the sheep are properly displayed in a well-fenced ring, the auctioneer is elevated above and away from the common rut of buyers, while every buyer can examine the sheep and make his bids in reasonable comfort.

I have always preferred public auction as a way of selling

Fig. 18. PASTURE PROGRESS (Welsh Mountain lambs fattening on the Welsh hills 1,000 feet up on land improved in the Cahn experiments. A November photograph.)

Fig. 19. PASTURE REGRESS (A crofter's cottage on Loch Fyne. Hill land, untilled, goes back to moor and moss.)

store sheep. If the sale is properly organized and advertised, buyers interested in one particular class of sheep come from a wide area and prices are fair. Different lots of sheep are sold in succession. Places in the catalogue are obtained by ballot. The best place in the ballot is usually about the middle; early and late places are not so good. At the beginning of a sale many buyers have not arrived, and all are cautious; towards the end many buyers have left and competition is less keen. That is the rule, although I have seen sales start with a bang and tail off, and others start cheap and end dear. As a general rule, however, a middle place in the ballot is best, so that if one finds one's sheep always at the beginning or always at the end it is best to interview Chance in the person of the senior auctioneer.

It is wise to see one's own sheep sold. The auctioneer has no right to sell sheep without the seller's consent. Auctioneers are honourable men, but they have a job of great delicacy. They must please both buyers and sellers. If a small lot of sheep is wanted by an influential buyer there is a temptation for the auctioneer to accept that buyer's bid. Moreover, if there is no sale there is no commission. Therefore, I think it wise to be present in person while the hammer trembles in the air. It is unpleasant to withdraw sheep that have not made their price. Done too often it will sicken buyers and spoil sales, but there is no point in throwing sheep away. I have seen sheep make 5s. a head below their value because two of the biggest buyers were out having a glass of beer. Looking back on past sales, I think it would have paid to withdraw sheep more often.

I believe in the close drawing of sheep before sale by

auction. The more level the lot is, the better the sale. A good sheep buyer takes the best for granted and looks for the worst. Uniformity, style, health are the things that draw bids. No sickly sheep should ever be exposed at public auction. Buyers are scared of unsound sheep, and one invalid suggests latent disease in the flock. Lame sheep should be kept at home, for buyers know that foot-rot is the bane of feeding sheep. Young ewe stock, lambs or gimmers, must be kept unmarked, no brand, no keel and no ear mark, for buyers wish to apply their own. It is wise to avoid any experiments with colour or shears. I once sold ewe lambs with their tails neatly squared. They sold badly because the dealers wishing to make up uniform flocks of larger size did not like a hundred lambs with clipped tails among four hundred others unclipped. The same reasons apply to colouring. Over-coloured sheep, particularly, are not liked.

If one has the personality to put buyers in good humour, so much the better for the sale of the sheep. When selling sheep it is a sound rule to tell no lies and to make no enemies. The man who goes about shouting that his lambs have never seen a bite of cake in their lives is branded as a cheat when the first pail rattles. It pays in the long run to tell prospective buyers the truth about sheep. A contented purchaser is the best advertisement to the character of a flock.

When sheep have been bought it pays to give every assistance in trucking the sheep. Good manners are appreciated and cost nothing.

If store sheep are sold by private treaty it is much safer

to wait until the main store sales are in progress and the price of sheep for that year is common knowledge. A dealer buying sheep before the store sales must necessarily safeguard himself by offering a price well on the safe side. Sometimes store lambs are bought privately year after year by the same buyer. That is a very satisfactory method where it can be arranged. It is a curious and unexplained fact that the same store sheep will feed much better on some farms than on others, so that a well-satisfied customer will be prepared to pay a little more for a regular draft that suits his farm.

At the present time, and probably for some time to come, all fat sheep must be sold to the Ministry of Food. Full twelve days' notice of the definite number of sheep and lambs to be sold must be given to the nearest collecting centre, usually the nearest auction market. Sheep accepted for delivery are graded according to estimated dead-weight, and payment is by fixed price per lb. Certain concessions are made in regard to hill sheep, in that seven days' notice of intention to sell suffices and a 25 per cent latitude is allowed in the estimate of numbers to be exposed for sale.

Chapter Fourteen

Controlling Disease

After price, disease is the biggest problem in stock-farming in this country. We do not suffer from drought nor from predatory animals. Even our dogs seem to be more domesticated than in America, where the stray cur has put an end to sheep-farming in some districts. Nevertheless, disease will on the average kill 5–10 per cent of ewes on an average farm in an average year, and when every lamb born is counted the death-rate among lambs may be found to be well over 10 per cent. When disease plays havoc the veterinary surgeon may be called in, and he may diagnose this, that or the next thing, but his visit is usually the end of a long, long story. Nobody knows that better than a good veterinary surgeon, but his job is not to tell a farmer how to manage sheep. He must give the trouble a name, prescribe something out of a bottle and try to stop the rot. Disease, unfortunately, is a much more complicated business than that, for in the vast majority of instances not one cause but a dozen causes acting together bring disease to the flock.

There is the breed. Some breeds of sheep are much more susceptible to certain diseases than to others. For several years I ran Greyfaces and Cheviots together. My main trouble with the Greyface ewes was inflammation after lambing; with the Cheviots it was weed. There is strain within a breed. In sheep, indeed in all kinds of stock, there is often more difference in resistance to a particular disease between different strains of the one breed than there is between breeds. That is easily understood. Men were thinking of wool and mutton when they selected out our various sheep breeds from a common stock. Hence, if one breed is more resistant to disease than another it is mainly a matter of accident, not of selection; but disease-resistant *strains* lie latent within breeds ready to be selected out should necessity arise.

There is natural immunity, which means that a sheep will resist a disease to which it has never been exposed. There is acquired immunity, which means that a sheep that has had a disease once is less ready to take it a second time. There is density of stocking, for the closer sheep are stocked the more likely the outbreak and spread of disease among them. There is nutrition, for the more poorly fed a sheep is the less resistance to disease it is likely to possess. There are bad weather, dirt and other things we do not understand.

These are the circumstances that favour the outbreak of disease—a strain of naturally susceptible sheep that have never had the disease before, too closely stocked and in poor condition, bad weather and dirty pastures.

These are the circumstances unfavourable to disease—a

strain of naturally resistant sheep that have been exposed to disease in the past, light stocking, good food, fine weather and clean pastures.

The importance of each of these factors has been instinctively recognized in sheep practice. When a farmer pays an extra few shillings for lambs from good-character stock, he is paying for natural disease-resistance in the lambs. When a man takes over a hill-grazing and pays extra acclimatization value for the sheep on the ground, he is paying, at least in part, for the acquired resistance of the sheep on the ground to the diseases prevalent on the ground.

Over-stocking is the fault of the inexperienced novice among sheep. He buys a few sheep and they do awfully well, possibly better than those of his neighbour who has been in sheep for years. He buys more sheep and more sheep until over-stocking brings disease.

Malnutrition, like a thief in the night, steals unseen upon the flock. A remark I have often heard is, 'My sheep have hardly had a bite all winter and I haven't lost a ewe.' Then spring and lambing bring their retribution. These are the words Hugh Borthwick wrote in 1873: "We have seen greater losses sustained from letting ewes too low in condition, or what is termed poverty by shepherds, than in all other diseases combined. If store-farmers would turn their attention more to keeping their breeding stock in comparatively fair condition, it would have a great effect in warding off many of those diseases which annually decimate our flocks."[1]

Weather! We don't have droughts, but we do have areas

[1] *Trans. High. and Agric. Soc. of Scotland.*, Ser. IV., Vol. 5, 1873.

of 40–60 inches annual rainfall, and the sheep in those areas look, to say the least of it, slightly washed out. Foul pastures, turning fouler and fouler while the plough rusts, a sign of our unbalanced agriculture. The causes of disease are too well known to sheep-men of experience.

Given a combination of these circumstances, disease breaks out. From whence does it come? From the sheep, from the soil, from the food, from the water? In most cases it comes from sheep. Suppose that in an otherwise healthy flock there is an old ewe carrying a few flukes in the bile-ducts of her liver. Nothing happens. A drain gets blocked and a field gets marshy. Still nothing happens. Then certain water-snails get on to the marshy ground, the eggs of the fluke in the old ewe's liver hatch out and the young flukes get into the snails, then out of the snails again on to the grass where the flock is grazing. Something does happen then. An epidemic of liver fluke begins among the flock, and the sheep die by scores.

A flock of hill sheep and cattle are grazing a hillside. Store cattle don't pay and are dispersed. Nothing happens. Old grass is uneaten, and ticks multiply in its shelter. Still nothing happens. Then ewes from another area are brought in, carrying the germ of louping-ill in their blood. The ticks feed on them and are infected. The ticks carry infection to other sheep. An epidemic of louping-ill breaks out, and sheep die by the hundred.

In most instances the sheep that spreads disease is not one that is obviously ill or one that dies quickly, but rather the sheep that carries the seeds of disease within it without showing external signs. Such a sheep may have had the

disease and recovered or may have become infected without becoming ill. Sheep of this kind are called 'carriers,' and are the common explanation of mysterious outbreaks of disease.

After the sheep themselves—the soil. It is common knowledge how anthrax spores may lie latent in the ground for years, and then suddenly cause death in stock. There are many other germs, particularly those that cause gas formation in tissues and blood and that lie latent in the soil. One sheep dead from the attack of such infection, unburied or not deeply buried, may pile up infection in the soil. Land that has been heavily sheeped for long is full of such germs. The eggs of parasitic worms, too, accumulate on ground where sheep are grazing. Freedom from germs and worms is the main reason for the great value of clean ground for sheep.

An east wind may bring trouble in its train, but not by the disease it carries. Air is not a source of disease infection, nor is water to the extent that was once supposed.

Even an absolutely healthy sheep is full of germs. Nose, throat, gut are full of them. Looked at in one way the gut of a sheep is a gas factory. Millions of germs produce gas, often poisonous gas, from the mush rumination makes of sheep's food. Any stoppage, any twist or any inflammation of the gut will give a chance to the germs always present, to multiply and produce a concentration of poison sufficient to kill a sheep. When the gut wall becomes weakened or injured from any cause, germs that cause no damage so long as they are confined to the gut spread through the sheep's blood and kill it. In much the same way a chill

wind striking a weak or hungry sheep may so weaken its lungs that germs living in its nose and throat, doing no harm there, spread into the lungs to cause pneumonia.

The knowledge of how disease works is useful in disease control. Unfortunately that knowledge is not yet complete, although much clearer than it was some years ago. It was then thought that if sheep could be kept clear of others obviously infected with disease, they would remain healthy. That is now known to be untrue. The causes that produce an outbreak of disease are many; the actual germ is known to be often the last chapter of a long story; the importance of the 'carrier,' the apparently healthy sower of disease, is recognized.

In discussing disease control, let us assume that the flock is a healthy one newly introduced to clean ground. Under such conditions sheep always do well. That is why sheep-farming sometimes seems easy to the novice, and why the big fortunes out of sheep have been made by the exploitation of sheep-free countries, as in the Scottish Highlands in the late eighteenth century, in Australasia and South America in the nineteenth century. If a man to-day wishes to find easy money in sheep, he must pioneer and search for good sheep country where sheep have never been bred before. Even then the healthy flock we have assumed is not free from disease germs. There will certainly, for example, be worms in them. What the novice usually finds is that the hundred ewes he has bought thrive and pay so well that he doubles his stock next year. Now if 100 ewes on a given area of ground have left £50 profit, 200 will not leave £100. Even where the original stock is maintained profits will

sink as the ground becomes foul. That is when skilful management and careful shepherding have their just reward. Any fool can run sheep on clean ground, but it needs an expert to make money where sheep have been for scores of years.

Disease is much more easily controlled in self-contained flocks, as on hill-grazings where only rams are bought in. The problem there is rather one of the foulness of the ground than disease among the sheep. Selection prunes out strains without resistance to the diseases prevalent on the ground, and the ewe stock, which may have been on the same hill for a hundred years or more, becomes adapted to its ancestral home and to the diseases it harbours. Were it not for the annual importation of rams—sometimes more remarkable for the sweep of their horns than their resistance to disease—the death-rate among hill sheep would probably be very much lower than it is.

The man who, as many low-ground farmers have to do, recruits his ewe-stock each year from outside sources is far more exposed to the risk of disease. With each purchase he may bring in diseased sheep, or what is probably worse, sheep that, although apparently healthy, carry the germs of a disease to which his own flock has no resistance. In purchasing breeding stock it is much more important to know the character of the stock they come from, whether they have a name for thriving or for dying, than to be able to judge sheep on their external appearance. Some poor-looking sheep make good prices because they are known to come from healthy country and from healthy stock, and some fine-looking sheep fall as false bargains to the novice.

Many experienced low-ground farmers take no risks. They recruit from the same stock year after year, and will sometimes pay heavily to beat an outside competitor. Others recruit directly and annually from the same stock, the sheep never going near a sale-ring at all. The big men will have hill-stocks of their own from which they replenish their low-ground stocks. From the point of view of disease control that is the best system of all, keeping everything in one's own hands, maintaining a chain of farms from the ewe on the hill-top to the fat lamb in the abattoir. Like many other excellent plans in farming to-day, it requires more capital than the industry can profitably secure.

There are times when a low-ground farmer, perhaps because of failure to obtain his supply from the customary source, is forced to venture into deep waters—to buy sheep he does not know. In such a case I have always reminded myself that the first duty of a breeding sheep is to remain alive, and I attempt to judge the vitality of a sheep on the carriage of its head and the brightness of its eye. I do not care how good sheep may otherwise appear, if their ears are droopy and their eyes lack fire they are best left alone. When strange sheep are brought home they should be kept by themselves as much and for as long as is possible in practice. It is much better to keep them apart until they have lambed, because if sheep pass that test with flying colours they can be classed as sound sheep.

Not only may sheep possess a natural resistance to disease, but veterinary science has shown how an artificial resistance can be produced. Natural resistance is the ability of an animal to resist a disease from which it has never previously

suffered; but an animal may also acquire resistance either by having had the disease or by more artificial methods. Thus the resistance of an animal to a particular disease can be raised by injecting into its blood either the germ of that disease, killed, weakened or in repeated small doses, or by injecting harmless quantities of the poison that the germ produces. The germ itself used in raising disease resistance is called a vaccine, its poison a toxin, and both vaccines and toxins may give a high degree of resistance lasting for a long time, although neither so complete nor so sustained as an attack of the disease itself produces. Vaccines and toxins used against one disease germ will not protect against another.

After an animal has had the germ or its poison repeatedly injected, its blood comes to possess a very high degree of resistance, so much so that when its blood serum is injected into another animal it confers protection against the disease. The degree of resistance given by this artificial, serum or anti-toxin method may be very effective while it lasts, but it will not last as long as the resistance given by vaccines or toxins, nor will the resistance produced by these be as lasting as that produced by an actual attack of the disease.

Veterinary science has achieved great success in the use of these artificial methods of increasing disease resistance. The usefulness of the method has by no means reached its limit. Control of many sheep diseases will undoubtedly be finally attained by the use of vaccines or of sera. Already in some of the Colonies, I understand, the needle and syringe are as much a part of sheep equipment as the dipper or the shears.

Chapter Fifteen

Sheep Vermin

The skin of the cleanest sheep harbours some parasites. I have, for example, never found a sheep without some *kaids* (or *keds*) on it. These are hard, flattened, wingless insects, rather like small buttons that move about in the sheep's fleece. They are blood suckers, piercing the skin and gorging until they are full. They lay eggs on the sheep's skin, and these eggs hatch out into small kaids. Fortunately, as far as is known, kaids do little harm to the sheep unless present in great numbers. The adult forms, but not the eggs, are destroyed by dipping.

Grass **ticks** are a pest on sheep in some districts—never seen in others. It is chiefly on hill pastures where there is much rough and uneaten grass that ticks abound. On the sheep they are most easily seen on the bare places beneath the fore-legs, on the udder of ewes, or about the neck. Everyone has seen ticks, the small head buried in the skin, the globular body like a sack distended with blood. When the females have had their fill they drop to the ground, where they lay eggs. The eggs hatch out into small ticks that grow and

change and eventually find their way back to the sheep. Ticks damage the sheep by the irritation they cause, but their main danger lies in the fact that they are carriers of at least two serious diseases of sheep—louping-ill and tick-borne fever. Dipping rids sheep of ticks temporarily, but the sheep will pick them up again off the grass. Theoretically, repeated dipping with an arsenical dip should decrease the number of ticks on a sheep-grazing very considerably. To be really effective, however, dipping every five days is necessary, and hill sheep cannot be gathered every five days. Moreover, the same kind of tick feeds on rabbits, hares and other wild animals, so that, again theoretically, these would have to be dipped every five days also! Burning stretches of rough grass destroys numbers of ticks, and the later in the spring this burning is done the larger the number of ticks destroyed.

Sheep **lice** can cause a great deal of irritation and prevent sheep from thriving. They are to be found about the head and neck, and are small, whitish creatures present, if present at all, in large numbers. Of all sheep parasites they are the most easily destroyed. Any efficient dip will destroy them provided the sheep's head is ducked under water. The presence of sheep lice is, to my mind, a sign of bad sheep husbandry.

Sheep-scab is caused by the tiny scab-mite that burrows in the sheep's skin, forming scabs. The signs of scab are the sheep's intense itch and the scabs at the base of the wool. In bad cases the wool falls out, giving the sheep a ragged appearance. Where scab is suspected a veterinary surgeon should be called in, because scab is a disease that is noti-

fiable by law (there are other diseases, such as scrapie, that cause sheep to scratch themselves all day; even kaids in large numbers will make sheep very itchy; but intense itching plus scabs on the skin mean *scab* unless proved otherwise). Scab is the disease that led to compulsory dipping. It is unfortunate that, except when double-dipping orders are enforced, dipping is ineffective against scab. Single dipping kills the mites but not their eggs, which are extremely resistant. Double-dipping catches the mites that hatch out of the eggs, before these mites in turn have laid other eggs. Scab spreads from sheep to sheep by the mites being rubbed off infected sheep on to fences, posts, and banks. Uninfected sheep rubbing against the same places pick up the mites.

There is an interesting point about all the external parasites of sheep, and particularly in scab. Well-fed, thriving sheep never become so verminous as those let badly down in condition. Vermin are particularly encouraged where lean sheep start to thrive. Very often severe outbreaks of scab occur in flocks of hill lambs bought to fatten. While the scab mite must have been present in such sheep, their breeder may never have suspected their presence. The conditions that favour wide outbreaks of scab have not been made clear, perhaps because sufficient thought has not been given to the matter. Such thought seems necessarily fruitless when it is known that ten years of double dipping rigorously enforced by trained veterinary inspectors in place of the local policeman would finish the whole question of sheep-scab—once and for all.

The **sheep maggot-fly** problem will not be so easily settled.

There are still too many gaps in our knowledge. Still, the facts are becoming clearer. The maggots hatch out of egg clusters laid in the sheep's wool by one particular kind of small green-bottle fly (*Lucilia sericata*). This fly is really a carrion feeder, but for some reason it has taken to attacking sheep. When the eggs hatch out in the sheep's wool the maggots break the skin and burrow in and feed on the living flesh. Eggs hatch out within twenty-four hours, and by forty-eight hours the maggots are fully grown, drop to the ground, burrow there and eventually come out again as green-bottle flies. Unfortunately, a sheep once struck becomes more attractive to the fly. More eggs are laid by green-bottles, and the blue-bottle occasionally joins in the feast, until the miserable sheep is eaten alive. There are certain things about a sheep that make it particularly attractive as a prey to the green-bottle fly. Anything that leads to continued damp soiling of the fleece, particularly scouring, will increase the number of sheep struck. In the worst times of bad seasons, however, I have seen almost every sheep in the flock, scouring or dry, struck in some part or other. There is no doubt also that the sheep maggot-fly is a trouble that is spreading and becoming more serious.

There is at present no sure and certain method of preventing sheep being struck. The most effective method is dipping, which, if carried out at intervals of a fortnight during July and August will decrease the number of sheep struck by one-half or three-quarters. Dipping with ordinary dip, followed by a dusting with flowers of sulphur in the dripping-pens is, in my experience, as effective as the

special fly dips on the market. Research with special dips, methods of dipping and spraying is very active just now, and it is along those lines that I look for a solution of the sheep-maggot problem.

I have much less faith in fly-traps. These, baited with liver, catch a wonderful collection of carrion flies, of which a mere 5 per cent are the criminal, *Lucilia sericata*. Since there is more than a little evidence that *Lucilia's* worst enemies are among the remaining 95 per cent, the trapping method seems rather foolish. It is surely bad generalship to sacrifice twenty allies in order to slay one foe. Further, the number of *Lucilia* is always so great in proportion to the number of sheep, that a reduction in the number of flies would not necessarily mean a corresponding reduction in the number of sheep struck.

Scouring sheep are more apt to be struck than clean sheep. Therefore, anything that makes sheep scour—abundant clover, worms, and so on—will favour the fly. When sheep are struck, early detection is essential. The only thing that can be said in favour of the maggot-fly is that it keeps the boys at home on summer evenings, for sheep must be looked to then throughout the maggot season. A man who rounds the sheep with the dogs will never see maggoted sheep. One must walk through them cautiously with dog at heel. A maggoted sheep is never at ease. If watched long enough it always scratches or bites. Often it stretches its neck half round as though weary, then continues to graze. There is a dirty, damp look about the wool over the places where maggots are working. With practice one can learn to spot a maggoted sheep by the nervous tightness of its skin.

When all the maggoted sheep in the flock have been identified then, and only then, may the flock be gathered and the affected sheep caught.

The first thing to do is to find the maggots. When the soiled wool is parted they are seen as a struggling horde on the sheep's skin. They must be dislodged. Let me say at once that the old method of pouring sheep dip over them has been proved to be wrong. Dip does *not* kill the maggots, but it does damage the sheep's skin. The best way to dislodge maggots is to wash the sheep in running water, meanwhile scraping off the maggots with closed shears. If no stream is available water is still the best thing with which to dislodge the maggots. The advantage of running water is that the maggots are drowned and cannot turn into flies.

When all the maggots are off the sheep the next thing to do is to put on a dressing that will help the sheep's skin to heal. Two useful remedies for the purpose are: (1) 4 per cent phenol in whale oil, and (2) 5 per cent zinc sulphate in water. Dip will not heal broken skin—indeed, by irritating the skin it leads to further strikes. Arsenical dips applied to open wounds caused by maggots have killed many sheep, to my knowledge.

By hard work and patient care the worst ravages of maggots can be prevented in lowland sheep. In fact, under such conditions, badly-damaged sheep are a sign of bad shepherding. On the hills it is quite different. There, repeated gathering and dipping is impossible and struck sheep are hard to find. They have a habit of hiding themselves in bracken and may never be found until the bracken dies off in autumn and bleached bones are exposed. In these circumstances,

when the weather favours strike—that is to say, when it is close and still, with bright sunshine and showers—the maggot-fly may cause hundreds of pounds worth of damage. What is badly wanted for hill sheep is some improved method of dipping or spraying that will make the sheep unattractive to the fly during the maggot season. The problem is difficult, but surely not insoluble. Research on this subject deserves the support, not only of flockmasters but of all interested in the prevention of cruelty to animals —for surely there is no worse fate a beast can suffer than to have flesh eaten off bones by a horde of maggots.

Chapter Sixteen

Sheep Worms

Sheep worms, like the poor, are always with us. There are three main types of parasitic worms in sheep —flukes, tapeworms and round worms. First for the flukes.

Liver rot has at one time or another caused tremendous losses among sheep. The flukes, looking like small grey, crinkled leaves, live in the tubes that collect bile from the sheep's liver. By their burrowing and irritation the flukes damage the liver until it literally rots and the sheep dies. Any shepherd can tell a fluky liver with its thickened bile-ducts and the flukes inside them. How do the flukes reach the sheep's liver? A complicated but well-known story. The flukes mature in the bile-ducts and their eggs pass with the bile into the sheep's gut and thence with its dung to the pasture. The young flukes hatch out and get into water snails. After spending some time in the snail they come out again and lie on the grass until a sheep eats them. The story of the fluke is complicated. It assumes many forms, but the important practical point is that until a

young fluke has spent part of its life in a water-snail it cannot infect a sheep. No water-snails, no fluke—and that is why rot used to be worst in a series of wet years such as 1879–1880.

Rot is most likely to occur in the autumn when pastures are damp and water-snails are plentiful. The young flukes parade up the sheep's main bile-duct and settle in its liver. For a time they make sheep thrive. An old custom was to turn fattening sheep on to fluky pasture in autumn. They did splendidly for a time and were slaughtered before they grew ill—because a fluky sheep may grow gravely ill if given time. There is a look about a fluky sheep that I find very characteristic but difficult to describe. It steps rather daintily yet seems rather uncertain of where it is going, like a very proud lady a little the worse for drink. By the time the better-known signs—the yellowish eye and skin—the poked jaw—the emaciation and weakness—are present, matters have been allowed to go too far for safe and effective treatment. For, largely thanks to those modest men of Bangor—Professor White, Mr. Montgomerie and their colleagues, fluke can be cured. Carbon tetrachloride capsules are the remedy, as every shepherd now knows.

When a fluky sheep is detected in a flock the dosing of the whole flock is generally advised. Some go further in insisting that sheep be dosed periodically as a preventive measure. I do not agree with that at all. While a sheep remains healthy I believe in keeping drugs from it, because every drug—including carbon tetrachloride—is to some extent poisonous, and there is no sense in poisoning healthy sheep. Where a sheep is unwell and fluke is suspected,

carbon tetrachloride must be used. I have every faith in it as a cure when used in time, but I do not like using it as a routine preventive. There are other measures which, while unable to eliminate odd causes of fluke, will, if thoroughly employed, prevent a heavy outbreak in the flock. The association between wet ground and liver-rot in sheep was well recognized long before the life history of the fluke was known. The reason, of course, is that without stagnant water, water-snails are scarce, and that without abundance of water-snails fluke will not spread throughout a flock. Sometimes in ponds or ditches water-snails may be seen swarming in thousands. A lump of bluestone dropped in the water will kill them all, for copper is very poisonous to snails. Drainage, copper, carbon tetrachloride are three means of fluke prevention and cure, and there can be no doubt that taken together they have cleaned up some very bad fluke areas. I know hill shepherds in the West of Scotland who would as soon go to the hill without their dogs as wanting a few carbon tetrachloride capsules in their pockets. So swiftly is a scientific remedy accepted by the farming public—*when* it is both practical and effective. The main danger of fluke outbreaks now lies in farms, usually free from fluke, becoming flooded in exceptionally wet years. Because of lack of experience, shepherds on such farms are less alive to the dangers of damp land, less able to recognize the signs of fluke disease and less energetic in its treatment.

It is possible for sheep to contain large numbers of flukes without showing signs of disease. In certain districts of West Scotland almost all sheep killed show fluky livers,

but deaths from liver-rot in the same districts are extremely rare. In fluke as in the other worm parasites of sheep the conditions under which the worms are relatively harmless or productive of serious trouble are still unknown.

To illustrate my meaning, I will describe my experience with the disease **husk** or hoose, caused by the hair-like round worm (*Strongylus filaria*). Husk is generally most serious in lambs, but the worst outbreak of it I ever saw was among old ewes. They were Blackface hill ewes from South-west Scotland, and they came up to North-east Scotland. They throve well for a time and then one or two died. The big death-rate began when they went on to cut roots. A dozen choked on the turnip slices during one afternoon. After lambing they died like flies. One died quite literally at the shepherd's door. The only way to keep them living seemed to be to wean them and this was done. The ewes lived but their lambs, of course, were spoilt. In all cases where the ewes were opened up there was found a firm jelly between lungs and chest-wall—that, and a patchy pneumonia.

Now the interesting point is this. The lambs from these ewes were unfit to sell in the autumn, so they were kept. They had grazed with the sick ewes for three months, yet no single case of husk occurred among them. Nor did any other sheep on the farm with which the sick ewes had come in contact show husk either. That is an illustration of what I imagine to be true of most diseases caused by sheep worms. There must be several causes working together before worms get the upper hand and cause dangerous disease.

That I am quite sure is true of the numerous kinds of

Fig. 20. FREE MILK (Cheviot ewes with lambs sired by Ryeland rams, for fat lamb production, Imber, Wilts.)

Fig. 21. CAKES AND ALE (Lambs from Dorset Horn and Hampshire Down ewes being trough-fed for out-of-season lamb, Clover Top Farm, Hitchin, Herts.)

Fig. 22. MIST OVER SCOTLAND (Scottish sheep on turnips, Thankerton Lanarkshire.)

worms that live in sheep's guts. There is, first of all, the **tape-worm**, the kind of worm that shakes off white segments containing ripe eggs. These segments are easily seen in sheep's dung. They are the only kind of worm that *can* be detected in sheep's dung. These tape-worms grow to a great length. Their heads are only the size of a pin's head, but their long, segmented tape-like bodies may measure feet. Despite their large size and ready visibility they are not the worst type of worm. The amount of damage they do to the sheep is still under dispute. There seems to be little doubt that in many cases they are harmless. Fat, well-thriving sheep may be found full of them when slaughtered. In other cases they undoubtedly do harm, but they are certainly not so harmful as the round-worms whose eggs are microscopic and cannot be seen in sheep's dung, and which are themselves difficult to detect even when the sheep's gut is opened and examined.

There are many kinds of **round-worms** parasitic in sheep. The number of species described as occurring in British sheep is over a score. Some of these are rare, and of others but little is known, but there are two of known importance and life-history that may serve as types for the rest. One is the twisted wire-worm (*Haemonchus contortus*), which may be seen as a red and wriggling thread on the wall of the fourth stomach of a newly-killed sheep. The other is the lesser stomach-worm (*Ostertagia* spp.), which is very much smaller and more difficult to find, but can be seen without the microscope's aid.

The life history is roughly similar in both species. Male and female worms live in the folds of the lining of the

sheep's fourth stomach—that division nearest the small gut. There they mate, and the female lays many thousands of microscopic eggs. These eggs pass right down the whole length of the sheep's gut and are voided with the sheep's droppings. There the eggs hatch out. The young worms feed on the droppings. Then they wriggle away from the droppings and burrow into the soil or climb up blades of grass. When the grass is eaten the young worms are eaten also, and pass into the sheep's stomach. In the sheep's fourth stomach, and there only, they become attached to the lining and grow into adult male or female worms.

There are two important practical points in this life history. In the first place worms do not multiply within a sheep. If a sheep contains a thousand worms in its fourth stomach, then each of those worms has been taken in with the sheep's food. Secondly, a lamb can only become infested with worms if it grazes on grass or other crop contaminated with sheep's droppings.

It is possible to rear lambs that contain no worms. If taken from their dams at birth and reared on food that has never been contaminated by sheep they will grow up worm-free. That is not mere theory—it has often been successfully done. Under farming conditions, however, each new generation of sheep is infected with worms from the previous generation, with the result that practically all sheep contain some worms.

Provided the worms are not too numerous and that the sheep are otherwise in good condition, there is no evidence that worms do the sheep any harm at all. At least, it is known that lambs may become butcher fat, reaching a weight of

80–100 lb. within three to four months, and yet contain one or two thousand stomach worms. Where, on the other hand, the worms are so numerous on pasture that every mouthful of grass brings a dose of worms with it, it is probable that even an otherwise healthy sheep will become ill from worm infestation. Where a sheep is not thriving or is badly fed it seems probable that even a moderate number of worms may make it diseased; but the common circumstances in which sheep worms give trouble is where worms are numerous and sheep in poor condition. The combination of many worms and weak sheep means deaths. It is also well known that worms are most dangerous to young sheep.

What are the signs that indicate that the sheep are worm-infested? They eat a lot without putting on weight; they handle badly; their coats are dry and without bloom; they usually scour; when caught they are far too easily held; they are weak and emaciated. If the upper eye-lid is turned up it will be seen to be pale and bloodless, and there will be matter oozing out of the inner corners of the eyes, matting the wool on the face. I believe most of these signs to be caused by anaemia—the result of blood lost through the damage the worms cause to the gut-lining. Moreover, I believe the small stomach-worm (*Ostertagia* spp.) to be a blood-sucker, as the larger stomach-worm (*Haemonchus contortus*) most certainly is.

The most likely disease with which worm infestation of lambs is apt to be confused is nutritional anaemia or pine, caused by a deficiency of iron, copper, cobalt, or other metallic elements in the sheep's food. The signs are so

similar that it is only when diseased sheep are opened up and the worms actually counted that one can be sure. Where the worms number over ten thousand the disease is probably worms, where less than five thousand worms are present the disease is more probably pine. Of course the worm counting is a job for an expert on worms. Such experts are now attached to several agricultural Institutes and Colleges, and their services could be more fully utilized with advantage.

I am absolutely convinced that far too much indiscriminate dosing of sheep is indulged in just now. The worm bogey has been run to death. Whenever lambs are ill-thriving the first thing thought of is worms, and the first thing done is to dose. Now there are a hundred and one reasons for lambs not thriving in addition to worms, and my own view is that lambs that are kept thriving are seldom troubled with worms. I have seen ewes and lambs running on dry, fibrous pasture—burnt stuff without life in it, no water before them, and no concentrates fed. Their owner was dosing regularly every month with copper sulphate. What the sheep were suffering from was starvation, not worm infestation. What they required was water, not medicine. Of course, when the dead lambs were opened there were worms found—plenty of worms—but no more than one can easily find in prime fat lambs coming to slaughter.

Very fortunately the type of management that suits sheep is unfavourable to worms. On permanent hill pastures worms are never numerous, because of light stocking. That is the kind of permanent pasture where sheep do reasonably well. On permanent lowland pasture sheep seldom thrive

so well. They do very much better where the grass is temporary ley and where farms are under cultivation and rotation, and, of course, cultivation is an enemy of worms.

I do not wish to suggest that worms never do harm to sheep, nor do I suggest that everything is known about worms and the damage they do. I am quite convinced, however, that worms get blamed for a lot of losses with which they have nothing to do, and that dosing with drugs is not the only method of dealing with the trouble. In any outbreak of disease due to worms there are two important factors at work—attack and defence—the number of worms and the sheep's resistance against worms. It is, I am sure, easier to increase the sheep's resistance than to decrease the number of worms. Worms are so tremendously prolific. An infested sheep may pass worm eggs at the rate of 44 per second, so that unless the sheep are clear of worms (and in practice they never are) when they go on to clean pasture, that pasture is soon fully infested. Even when a drug *is* effective and clears out the worms these will soon be replaced by others. The newly-introduced 'phenothiazine' is a definite advance in drug treatment. The older copper sulphate treatment was only really effective in clearing out the one species of worm—the larger stomach-worm. Phenothiazine is also remarkably effective against many other, but not all, of the internal parasites of sheep. Drug treatment against sheep worms, although of improved value, must still be used to augment rather than replace proper nutrition, rotation of pastures, and sound sheep management.

Sturdy or gid is caused by one stage in the life history of a small tape-worm that infests dogs or foxes. Infected dogs

pass the tape-worm eggs on to pasture where sheep are grazing. The sheep swallow the eggs, which hatch, and the young worms get into the blood and thus to the brain where they form cysts. The pressure of the cyst causes the sheep to stagger and go round about in circles. When the sheep dies or is killed and its brain happens to be eaten by dogs or foxes the cyst gives rise to a tape-worm again.

Prevention lies in an occasional worm-purge for the shepherds' dogs and the burying of dead sheep, two advisable practices apart altogether from the question of 'sturdy.' Affected sheep can be cured by operation, puncturing or removing the cyst through the skull bones, or puncturing by passing a wire up the sheep's nose. These operations are more often talked of than performed. It is more humane and usually pays as well to send the sheep to the butcher at the first opportunity.

Chapter Seventeen

Sheep Diseases: Ewes

It is not proposed to write a formal treatise on the veterinary medicine and surgery of sheep. What I intend to do is to discuss those diseases of which I have had experience and which have given me much trouble in the management of flocks.

Pregnant ewes, in my experience, give little cause for anxiety during the first three months they are in lamb. It is after that that trouble begins. It has always puzzled me why the ewe flock in one year comes to lambing without a single death or abortion, while the next year, under very similar conditions, everything goes wrong. I think a great deal depends upon what condition the ewes are in when winter starts. That is particularly evident on the hills, where a fine summer and mild autumn put the ewes in shape to stand a hard winter. On the other hand, after a cold and wet summer ewes are less able to withstand a much milder winter. In low-ground farming an open winter is often dangerously deceptive. In hard weather, with frost and snow, supplementary food and in particular hay must

be given to the ewes, but when fields are green there is always a temptation to economize on feeding without full realization of what very inferior nourishment winter pasture often is. The point is that when pregnant ewes start dying or aborting the cause may have to be sought in events that occurred several months before.

While **abortion** in cattle is usually due to infection, in sheep the cause is more often nutritional. Infectious abortion does occur among sheep, but I have never seen it myself. On poor hill-grazings, however, non-infectious abortion is often a serious cause of loss. It is always more common in ewes of the younger ages, particularly in gimmers. My experience is that when ewes are young and still growing they are apt to meet under-feeding by abortion, but that old ewes usually go to skin and bone in producing normal, full-term lambs. In discussing abortion in ewes it is usual to talk about minerals and vitamins. Without attempting to minimize the importance of these factors I would suggest that before exploring the possibilities of deficiency disease, it is well to make sure that the ewes are, in plain language, getting their bellyful of food. On many hill-grazings during winter they do not. I have opened up dead hill ewes in the month of February to find them stuffed with dead bracken, heather twigs, and moss. There is no obscure deficiency disease present under such conditions; merely plain starvation. It surprises me how hill ewes can lose one-third of their weight during winter and still produce and milk a living lamb: it is less surprising perhaps than that they may sometimes abort or die.

There is no doubt, however, that mineral deficiency may

on occasion lead to abortion in ewes, the deficient minerals usually being phosphates and lime. I do not advise rushing away to buy mineral licks and compounds whenever a ewe aborts. The best source of lime is clover hay, and of phosphates, bran. I particularly dislike mineralized salt licks. Salt licks without added minerals certainly—they should be before every pregnant ewe, for it is before and after lambing that sheep require and eat most salt; but I dislike mixing other things with the salt, because the pregnant ewe in its craving for salt may easily eat too much of them. Iodine, for example, in anything but small amounts is a poison; rock phosphates may contain another poison—fluorine. Lime and phosphates in excess may cause abortion and malpresentation, the very things they are fed to avoid. If lime and phosphates *are* fed in their mineral form, they should be given at the rate of 1 oz. of sterilized bonemeal per sheep daily mixed with an equal quantity of oats or bran.

Many of the results of earlier experiments that suggested that abortion was due to lack of lime have since been proved to have been actually caused by a deficiency of Vitamin A. This vitamin is formed by the animal liver from the plant pigment *carotene*, which gives colour to carrots and yellow maize but is also abundantly present in green grass and sun-cured clover hay. Where pregnant ewes get too little carotene, as where they have to exist on dry, dead pasture for many months, they may suffer from Vitamin A deficiency and abort as the result.

Certain mechanical causes, crushing at gates, walking on puddled land, being chased by dogs or disturbed by hounds, are commonly blamed for abortions in sheep. I do not hold

them blameless, but they are never the whole cause. For example, in North-east Scotland we can spring-dip sheep with an easy mind and in the ordinary way. In certain districts of West Scotland, however, if they risk a spring dipping at all, they handle the ewes like their grandmothers' china. That, I think, explains the fact that dogs among one flock of sheep will leave a score of aborted sheep behind them, while in another flock no damage results. The dog presses the trigger, but nutrition loads or unloads the gun.

Pregnancy toxaemia is a disease of ewes which is on the increase. When shepherding as a boy in the Border districts I never saw it, but I have come across plenty of it since. It is a disease uncommon in hill sheep. Personally, I have never seen it in a hill ewe. The types of flock in which I have known it cause severe losses are those on small arable farms where the ewes are usually in pretty good condition, given plenty to eat, and are heavily in lamb. About a month before they are due to lamb an occasional ewe shows the signs of pregnancy toxaemia. If one can imagine a sheep under the heavy influence of dope, that is the appearance of a ewe suffering from pregnancy toxaemia. She is usually in good condition when handled, she may even be fat, she is often paralysed and sometimes blind. If such a ewe dies, the post-mortem appearances are quite characteristic. The liver is pale, fatty and crumbly. I have heard it well described as 'like cod's roe.' The kidneys are fat, flabby and shapeless. There is usually a good deal of fat about the gut, and there are usually twin lambs. The cause of the condition may be wrong feeding, but it is not over-feeding. During the winter of 1935–36 I had a typical case of the

disease in a ewe on bare maintenance diet. The best preventives I know are exercise, growing feed, salt and water. I sometimes think that constipation has much to do with the trouble. The best treatment is salts and treacle—2 oz. Epsom salts and ½ lb. of treacle, followed up with sufficient treacle to keep the bowels open, then a change of feed to green growing crop.

Lamb-bed trouble. A ewe's lamb-bed may come partly down before she lambs. In ewes heavily in lamb and fed too many roots this may often occur. The condition is easily cured. The ewe is held up by the hind-legs and the protruding lamb-bed washed clean with tepid water, then pressed back carefully out of sight. There are special metal clips made for partly closing the passage which I have found most effective. Some shepherds put in a couple of stitches or tie locks of wool across. Whatever method is used, naturally the obstruction must be removed when the ewe starts to lamb. In my experience such ewes come to lambing and lamb normally without further trouble.

When the lamb-bed comes down *after* lambing the matter is a much more serious one. It is most often the result of inflammation, which has made the ewe start pressing again after lambing. The extrusion of the lamb-bed in such cases is not the only nor the worst trouble. To push back an inflamed lamb-bed and tie its exit is merely to hasten an inevitable death. If the lamb-bed is purple, gangrenous and stinking, I think the only humane thing to do is to kill the sheep. If, however, the lamb-bed appears clean and healthy, it is worth while trying to put it back. After washing and disinfection the lamb-bed is replaced, the ewe being held

up by the hind-legs. The method of replacement is like starting at the foot of a stocking and rolling it inside out. When the lamb-bed is replaced, a clean bottle should be pushed in and turned gently round to smooth out the creases. A clip on the passage and a dose of laudanum complete the operation.

I have mentioned disinfection. The shepherds' favourite is lysol; why, I do not know. In my view there are on the market superior disinfectants that a modern veterinary surgeon will recommend.

Lamb-bed extroversion is, as I have said, most often a direct result of lamb-bed inflammation, quite the most deadly disease of lambing ewes. My experience of inflammation is this, and a very bitter one it has been. A lambing proceeds safely without a case until a particularly difficult delivery occurs. The shepherd, in his efforts to get out the lambs, damages and infects the ewe's lamb-bed. The ewe dies of inflammation, and very soon after other ewes go down with it. In the height of an epidemic I have seen ewes die of inflammation that have never been handled at all. Symptoms of post-lambing inflammation are but too well known. The ewe, some hours or occasionally as long as two days after lambing, begins to press as though in labour. Sometimes she presses so hard that her lamb-bed turns inside out. At the same time she has high fever, often has a dirty discharge from her passage and is obviously in great pain. It is possible for a ewe to be fevered and have pain after lambing, even press a little, and yet recover, but I cannot recall a ewe that pressed really hard and for a prolonged period and ultimately recovered. Treatment of

any kind is most unsatisfactory, first because it is rarely successful in saving a ewe, although it may prolong her life, and secondly because a shepherd touching a ewe ill of inflammation is all too likely to infect other ewes which he is forced to assist. After trying all kinds of treatments I have been driven to the conclusion that the best thing to do is to put the sick ewes in a field by themselves to recover or to die. Dead ewes must be buried by someone other than the shepherd.

Prevention pays better. Ewes that have been allowed to become over-lean before lambing have little resistance to inflammation. Weak ewes, congested and dirty lambing quarters, or an over-hasty shepherd, favour the outbreak of inflammation; strong ewes, space and cautious handling are all against it. I think shepherds are too careless of the dangers of infecting the pregnant womb. They step in where veterinarians and doctors fear to tread. The minor complications of lambing, the twisted-legs and back-legs presentation can be safely corrected without special precautions as to cleanliness, but when the actual womb is entered a boiled surgical rubber glove should be worn. Dipping a dirty hand in a pail of diluted carbolic is no disinfection at all. It is obvious that a shepherd will not and cannot be expected to use a rubber glove except on rare occasions, but he should not require to put his hand into the womb except on rare occasions, seldom more than once in every hundred ewes lambed. A man constantly fiddling about inside sheep should be put on the tractor. Once inflammation has started in a flock strict isolation of sick sheep is the only useful remedy. Isolation implies two

things: that the sick sheep are separated from the sound, and that the man tending the sound sheep keeps right away from those that are sick. Some breeds are more subject to lambing inflammation than are others. Among Scottish sheep I have had far more trouble from this cause in Border Leicester crosses (Half-bred and Greyface) than in Blackface and Cheviot. More research might profitably be devoted to the prevention of inflammation in lambing ewes. Looking back, I am sure I have lost more good ewes from it than from any other cause.

After inflammation, I have found **weed** of most trouble in newly-lambed ewes. Weed, sometimes called *mastitis* or *udder-clap*, is an inflammation of the udder. Whilst not usually fatal, it can be deadly enough when weakly ewes of the short-woolled breeds face cold, wet weather. In my experience, hacked teats are the most common cause of weed. Hacked teats give entrance to germs and prevent the ewe suckling her lambs in comfort. The congestion of milk and the germs, with the help of a cold day, are almost certain to cause weed. It may also occur without hacked teats, as where a ewe, usually with twins, temporarily loses her lamb overnight and faces a cold dawn with distended udder. Any sudden chill may bring on weed, as where ewes have had their hind quarters too drastically cleared of dirty wool.

Cracked teats are easily recognized. A ewe walking quickly over the field followed by a hungry bleating lamb with soiled head almost certainly has cracked teats. Such a ewe should be taken into a warm shed at once, be milked by hand and have the sore teats cleaned and washed. All scabs must be cleared away and the raw places they leave

painted with tincture of iodine. The lamb must be kept in a separate pen and only allowed access to the ewe three times a day. With warmth, cleanliness and the greatest possible freedom from the lamb's sucking, cracked teats usually heal. If they refuse to do so, the lamb must be weaned.

A ewe with weed, whether or not preceded by hacked teats, is obviously very sick. She stands by herself in a corner of the field, head down, ears drooped, back arched. When examined, the udder on one or both sides is found to be cold, hard, and sometimes blue. Often when the milk is drawn off it is found tinged with blood or mixed with matter. Treatment and the possibility of cure vary with the severity of the weed and the stage it has reached when noticed. In every case the ewe must be taken to warm shelter and separated from her lamb; she should be freely purged with Epsom salts and have clean rags, wrung out of very hot water, repeatedly applied to the udder; milk, of course, must be drawn off by hand. When the udder is quite blue, and especially when the blueness has spread to the belly, the only thing that can be done is to cut freely with the knife, for unless the poison is drained off in this way the ewe will surely die. Mastitis is not usually a very fatal disease, but it causes much local damage to the udder. It is apt to recur in subsequent seasons, and blind teats are a common sequel. The majority of ewes sold at autumn sales as 'unsound below' are recoveries from cases of springtime weed.

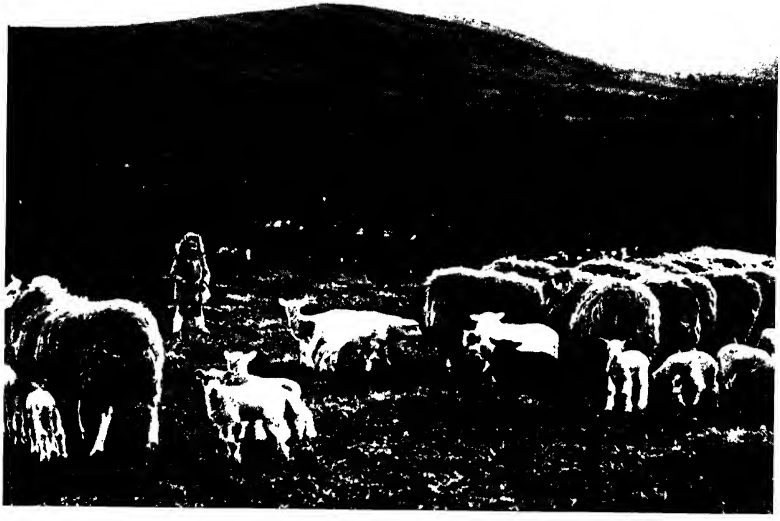
Deaths from **backing** may be an annoying source of loss before the ewes are shorn. Predisposing causes are verminous sheep and flat fields. The remedy of turning the ewe right

side up is so simple that deaths are apt to be attributed to the shepherd's inattention. It is not always recognized how quickly a ewe on her back may die. It all depends upon the amount of fermentable food in her stomach and the strength of her heart, because it is the pressure of stomach on heart which kills her. When weather is warm and pastures are full of clover a ewe may die in a few minutes. I remember once seeing a ewe turn on her back in a field, crossing the gate to right her and finding her dead. That, of course, is unusual, but ewes that get on their backs after the shepherd's evening round may easily be dead before morning. Some ewes are much more apt to go on their backs than others, and they will do it repeatedly. It is therefore a sound plan to shear every ewe that is found on her back. Once the wool is off her she is reasonably safe.

Foot-rot, although never fatal, probably causes more loss than any other sheep disease. Some breeds are more subject to it than others, but none, to my knowledge, is absolutely immune. The old writings say that the Merino finally failed in Scotland because of its being so subject to foot-rot. I know of no disease so easily prevented and so difficult to cure in adult sheep. In lambs I have found it much more amenable to treatment. My view is that if sound sheep are put regularly through the copper sulphate foot-bath they will never go badly lame. I learnt that from experience in keeping sheep for long periods in indoor pens. At first they all went hopelessly lame, and it made no difference what kind of bedding was used or what treatment was employed; but if they were kept going through the foot-bath at fortnightly intervals they remained perfectly sound. Par-

Fig. 23. WOOL HARVEST (Sheep shearing, Broughton, Peeblesshire.)

Fig. 24. THE TIME TO LEARN (Cross-breds and lambs, Broughton, Peeblesshire. This little girl will know sheep when she grows to be big—if she goes on watching!)



ticularly where sheep are going on soft ground a combination of copper sulphate, which kills the germs, and of arsenic, which hardens the hoof, is most effective. Personally, I use 'Arsenicol' for this purpose. Foot-rot in young lambs can usually be cured by hand-dressing with any of the numerous caustic 'foot-rot cures' on the market.

The less the knife is used in treating foot-rot the better for the sheep. Distorted and claw-like hoofs are a *result*, not the cause of foot-rot, and a drastic cutting away of horn, in my experience, does more harm than good, and that is especially true where blood is drawn. I have seen some pitiful results of shepherds' surgery. Neglected or badly treated foot-rot may bring sheep to a terrible pass, the pared raw feet picking up blood infection at every step until the legs become masses of sores and festers. As well slash a man's feet and ask him to walk on a midden!

I have dealt with those common causes of loss among ewes—so common that they are apt to be accepted as inevitable—which nevertheless cause trouble in almost every flock. There are many others of which I have read, but of which I have had little or no practical experience. It is well, I think, always to remember that a disease is a complex affair of which disease germs are only one aspect.

Well-managed flocks are wonderfully free from disease, but a veterinary surgeon can always give a diagnosis where a shepherd has made a mistake.

Chapter Eighteen

Sheep Diseases: Lambs

As in discussing the diseases of ewes, I intend to deal only with those causes of losses among lambs of which I have had personal experience and about which, therefore, I may have something useful to say.

A great number of young lambs die in every flock even where no serious epidemic disease such as lamb dysentery occurs. Most flockmasters never count their lambs until tailing, so that this loss is seldom realized. Every farmer can tell his losses between tailing and sale, but, in my experience, that is a period during which relatively few ambs die on healthy ground. Particularly in wet and cold springs my main losses among lambs have been before they are tailed, and in my opinion the main causes of loss are want of care, bad weather and dirt.

The first lambs born always receive considerable attention, but as lambing drags on sheep are spread out over the farm, men are jaded and the young lambs suffer. The ideal way to organize a lambing is to have one man responsible for the actual lambing and another to look after the young

lambs once they are born. A good ewe can tend a single lamb herself, but young twins, left too much to themselves, can go badly wrong. It is especially important to ensure that all twins are safely mothered before dark. A ewe will not search indefinitely for a lost twin, and a young lamb lacking the ewe's warmth at night may easily catch pneumonia and die. Further, if a lamb lies beside the wrong ewe all night, its own mother may be unwilling to take to it next day. It is therefore very important to go through the flock of young twins at dusk, restoring any lost lamb to its dam. To do this quickly and without mistake it is useful to put a distinguishing keel mark on each pair of twins, a spot on the heads of one pair, one on the rumps of a second pair, and so on. I know of no more profitable job for a shepherd than to walk carefully through the young twins at darkening, leaving his dogs at home.

Judging from the casualty lists, I have found heavy rain driven by a cold wind the worst weather for young lambs. Snow is bad enough, especially when it drifts, but it doesn't seem to chill lambs so quickly or so severely as cold rain. If lambs are well-fed with milk, dry cold does them no harm; it is wet and cold together that cause damage. Pneumonia is the common cause of death in young lambs exposed to bad weather. When such a lamb is opened the lungs are found to be dark and solid like liver, not pale and spongy as is normal. Any kind of shelter—buildings, trees, walls or hedges—is invaluable to young lambs on stormy nights. The sheep must be driven to shelter and *kept* there. Too often I have driven ewes and lambs to shelter from the wind and looked back to see them spreading out again over the fields.

Roots laid down along the hedge-side help to keep the ewes where they are wanted, but in emergency a rope net run across a sheltered corner of a field will make for absolute safety. Running up nets in a storm of wind and rain is no pleasant job, but sometimes it must be done.

Dirt is very dangerous to young lambs before their navels have healed. For some days the navel is an open wound connected by a clot-filled vein with the lamb's liver. Infection on the navel can very readily pass along this vein to set up abscesses in the liver, or the infection may pass through the liver into the blood and settle in lungs or joints. **Joint-ill** is one serious result of navel infection. Once infection has got into a lamb in this way there is but little one can do. The lamb may linger on through summer as a piner, but most often it will die. Prevention, as in all sheep diseases, is much easier than cure.

Ewes infected with foot-rot spread a lot of trouble of this kind among young lambs, so that it is important that ewes come to lambing with sound feet. I once asked a bacteriologist to examine the abscesses from some young lamb that had died, and he found the same germ in them that causes foot-rot among sheep. It is sometimes difficult to keep a lambing-field reasonably clean, but dead lambs and rotting cleansings lying about, as one sometimes sees, encourage disease. Any lambs with inflamed navels should be isolated from the rest. One of the reasons I dislike straw shelters built in the fields is that they become fouled by ewes and lambs gathered there, and that young lambs rest their navels in the dirt.

I have faith in tincture of iodine brushed on to the cords

and navels of all young lambs. It helps to dry and disinfect the navel and, used regularly and as a routine, helps considerably to reduce the deaths among young lambs from navel-ill.

Wool-ball. The change from a diet of milk to one of milk and grass occurs when the lamb is about one month old, when many fine lambs die. The losses may be very disheartening. The lambs are thriving, they may all have been playing together in the evening and then half a dozen may be found lying dead next day. We used to call these casualties 'wool-ball' deaths, for when the lambs were opened up we found wool in their stomachs. Unfortunately for the theory, when we started selling 'milk-lambs' to the butcher we found wool also in the stomachs of these healthy lambs. Now, I do not suggest that lambs never die from obstruction due to wool: they do, and the symptoms and post-mortem findings are quite typical. A lamb ill from wool-ball is usually found *alive* but unconscious and stiff. The legs are stretched out and the head bent backwards. Such a lamb may linger on for days. When it dies, a wool-ball of variable size is found in the stomach and the gut is empty. If such a lamb is operated on and the wool-ball removed it will live.

In my experience, the great proportion of lambs dying at one to two months of age do not suffer from wool-ball at all. They die from what has come to be called **entero-toxaemia,** which, being translated, means blood-poisoning from the gut. In some countries, New Zealand for example, the disease is called **pulpy kidney.** Certainly soft, pulpy kidneys are a common post-mortem change. What seems to happen is this. The lamb takes in with the grass certain

germs which, finding conditions in the gut suitable for their growth, multiply and produce poisons that, when absorbed by the lamb's blood from its gut, rapidly cause its death. In efforts to get rid of this poison the kidneys become so damaged that very soon after death they degenerate into soft pulp. Since all lambs on a pasture ingest these poisonous germs, and since only a certain number suffer from their effects, it is clear that there must be something peculiar in the lambs that die. Two observations suggest that the amount of grass, and consequently the number of germs eaten by the lambs, may play a part. The first is that 'yarding,' that is to say penning the ewes and lambs off grass for a part of the day, helps to reduce the death-rate. The second is that the lambs that die are usually strong, quickly growing lambs, probably greedy feeders that eat most grass. Again, it is possible that a wool-ball that does not cause death directly by stoppage of the gut, may yet dam back the gut contents sufficiently to give the germs more time to produce a large amount of poison. Finally, there is, to my mind, no doubt whatever that the condition of the pastures, either so dry that lambs are costive or so lush that fermentation in the gut is excessive, are important in favouring deaths from entero-toxaemia in lambs. I have repeatedly seen death from this cause stop quite suddenly following a change of wind or a shower of rain. The best preventives, in my experience, are young grass when weather is cold and dry; concentrates when weather is wet and warm and grass is growing fast. These measures will decrease the number of deaths but will not prevent them altogether. I am very hopeful of the possibilities of vaccine or serum

treatment. The time during which lambs are susceptible to the disease is strictly limited. It is a trouble of the short transition period between suckling and grazing. Once lambs are fully accustomed to a diet of grass they do not die from entero-toxaemia. If lambs can be protected for about a month from the danger of blood-poisoning from the gut, a large number of thriving lambs may be saved. A specific and effective pulpy kidney antiserum is now prepared, and should this trouble continue over more than one season, a veterinary surgeon should be consulted and the antiserum used.

Chapter Nineteen

Sheep Future

Farming in general is changing very rapidly both in practice and ideas. It is rather characteristic, both of agricultural and social systems, that long periods of stability or stagnation are followed by rapid intervals of revolutionary change. So, without venturing to assume the woollen mantle of an ovine prophet, I foresee some very radical changes in our sheep husbandry practices—practices that have endured without fundamental alteration since the latter half of the eighteenth century.

First—mechanization has arrived, and mechanization is going to make possible what has been a crying necessity for fifty odd years—the renovation and cultivation of our upland grazings. It will also cause some radical alterations in the conditions and cost of farm labour.

Secondly—the State has taken control, and not for a moment do I foresee the State ever entirely losing its grip again.

Thirdly—and this is bound up with my second point, because with State control it will come much more quickly

—we are on the eve of a tremendous application of biological science to stock farming. As Dr. John Hammond writes in the preface to his book *Farm Animals*,[1] "During the last hundred years great advances have been made in the physical sciences, as witness the steam engine, motor-car, telephone and wireless. The experiments now proceeding in biological laboratories are beginning to show promise that during the next hundred years an equal advance will be made in the control of the animal."

Perhaps to some it may seem rather a bleak and grim promise. Instead of putting on our best clothes to go to the ram sales, and smoking a quiet pipe and leaning over the hurdles in grave contemplation of gaily-coloured sheep, we may receive a small registered parcel of State-registered ram's semen from a State-registered proven ram of a type regarded as most suitable for the flock by a State-registered sheep inspector.

I do not think the State will permit farming to relapse into pre-war depression. It will I think guarantee solvency but insist on efficiency. The full utilization of scientific invention and advice, of veterinary inspection, and marketing control will, I foresee, become the legalized conditions of good husbandry.

Now, it is abundantly clear that unless people continue to eat mutton and continue to wear wool, there will be no sheep farming. I cannot see the future State propping up an industry the usefulness of which had gone, just because a limited number of excellent people had interests in sheep. Live-stock industries *can* go—the ostrich farming of South

[1] *Farm Animals*, 1940 (Arnold: London).

Africa is a notable example. It cannot be assumed that people will continue necessarily to eat as much mutton or to wear as much wool. War-time rationing has shown that we can survive without damage to our health on quite small quantities of meat. Nutritional science prefers the protective animal food-stuffs—milk and eggs—to beef, mutton, pork, as abundant articles of national diet. Quite astounding advances have been made recently in the manufacture of wool fibre substitutes from vegetable sources. All this sounds rather gloomy for the future of the sheep industry!

As yet, however, I do not foresee an effigy of *The Last Shepherd* in Madame Tussauds, nor the transference of this book from an agricultural to an historical series! Food is going to be scarce for some considerable time, and so is money with which to buy food abroad. In January of 1944, Sir John Anderson, Chancellor of the Exchequer, said in the House of Commons:—

"We have got to make ourselves as far as we can independent of imports from overseas, which would burden not only our shipping but our exchange, and we have got to make sure that as much food as possible is made available for the rehabilitation of the starving countries of Europe."

We shall, indeed, require to make the utmost use of our land for a long time to come, and when we speak of our land we must remember that one-third of Great Britain is hill land—and much of that hill land is sheep country.

It is because so much of our acreage can be best utilized by sheep in the production of much-needed food that I foresee sheep, perhaps more sheep than ever before, in hill districts. At the same time I think that hill sheep will have to

become much more independent of the low country for wintering and markets. It will be necessary for more sheep to be wintered in the hills, and more sheep sold for slaughter off the hills, and that will mean cultivation, expensive in capital but worth while. I am convinced that the potential contributions of hill land to our food supply, even in to-day's emergency, are scarcely tapped. There are not the resources in hill farming itself to undertake such a job. Nevertheless, if the State provides the drive, the capital, the machinery, the job can be done. Give us the tools!

So taking it all in all, we are not likely to be done with sheep yet. At least in the fastnesses of its hill retreat the industry will survive, gaining in efficiency, progressing in productivity, retaining its romance.

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